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A DISTRIBUTIONAL SUMMATION OF THE
ORNITHOLOGY OF LOWER CALIFORNIA

BY

JOSEPH GRINNELL

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JOSEPH GRINNELL

(Contribution from the Museum of Vertebrate Zoology, University of California)

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INTRODUCTION

The purpose in beginning the present undertaking was to find out just what birds exist within the territory of Lower California, together with the outstanding facts as to the local and seasonal occurrence of each of the species and races. Such an aim may at first thought appear to be a simple one, easy to follow to a satisfactory conclusion. In reality, as the undertaking developed, difficulty in the effort to achieve a desirable standard of accuracy arose on several counts:

1. In the territory dealt with there is much confusion in the employment of place names; precisely the same name recurs, in many instances, over and over again in different sections of the peninsula. And some of the writers who have published on Lower Californian ornithology have been obscure or ambiguous in their use of locality names.

2. Much of the collecting of specimens in Lower California has been done by non-professional or casual "ornithologists." The work

of these amateurs is often characterized by inexactness and many outright errors. Nevertheless, it must immediately be said that without the amateur very much of the information now available in regard to Lower California would be absolutely wanting. His enthusiasm and his vigor have led to the visiting of remote places and to the collection of materials which afford facts of fundamental and lasting value to systematic and faunistic ornithology.

3. There have been numerous misidentifications in the published literature, of full species as well as of the more finely distinguished subspecies. Suspicion has made it seem necessary to "run down" very many cases, with results frequently confirming suspicion, though at least as often showing that the original determination, whether a guess or not, was correct. Some of the printed lists show ideal care in their compilation; others give indication of having been thrown together, chiefly from memory. A revisionary study, such as the present one is, serves to bring out the good points and the bad ones, marking the worthy contributions as contrasted with the ones that never should have been printed, at least in the form in which they appeared.

4. The literature relating to Lower California is widely scattered; in the aggregate, as finally assembled, it is voluminous, as will be comprehended by scanning the accompanying bibliography. Even so, there must be yet other articles that the present writer has failed to find, and to which preceding writers cognizant of them have failed to refer.

5. Out of the numerous collections of birds which have been made in Lower California, some have been widely distributed, by sale or exchange. This has resulted in difficulty or sometimes absolute failure in the attempt to verify the original basis of a published record.

6. The valuable and extensive Bryant collections formerly in the California Academy of Sciences were burned in 1906, so that no chance at all remains for verification or study in that connection.

It has been with the realization of the above several circumstances as constant hazards that the present author has brought his labors in this direction to a close. He is naturally aware of a certain percentage of error that must still remain, some of which will be corrected by future workers. Nevertheless it is hoped that this contribution will serve in some worthy measure to speed up the growth of western ornithology as well as, possibly, to raise its standards.

ACKNOWLEDGMENTS

The work here reported upon had its very beginning on September 19, 1924, when Miss Annie M. Alexander, founder of the California Museum of Vertebrate Zoology, laid before the writer her plan, evidently already well considered, to undertake the support of faunal exploration in Lower California. In the discussion which then took place, prospective values of vertebrate collecting in that region were suggested as follows: Assembly of materials, to be added to the scientific resources of this Museum, the study of which would throw new light on the faunal relationships of Upper California and on those within the Pacific Coast district generally; ascertainment, in as fine detail as possible, of the ecological features of the previously lesser known northern portion of the peninsula, most especially the San Pedro Mártir "section" of it; and the new systematic knowledge of all the groups represented, to be derived from minute studies of both the specimens and the environments.

Miss Alexander's proposal was promptly put into operation, and for large parts of three years, beginning early in 1925, the Museum has had collecting under way in Lower California, supported by her entirely outside of her regular appropriations for the Museum's maintenance. The numerous specimens of birds and the appertaining notebook information, included in the resulting materials, constitute the first and essential basis of the present general report. Various short papers, mostly systematic in scope, relating to the collections of birds, have already appeared (see the appended Bibliography). All these, as well as the present larger paper, are essentially "contributions" from the University of California Museum of Vertebrate Zoology in that, without the advantages provided under the auspices of this institution, their production would have been impossible.

In the normal course of carrying out an undertaking of the nature of the one here reported upon, I have found it necessary to appeal to numerous institutions and individuals for helps of many sorts. These helps have ranged from outright gifts of needed specimens to the Museum of Vertebrate Zoology, through loans of critically valuable materials, to painstaking services in looking up literature or manuscript records or in verifying the identity of specimens. Institutions to be named in this connection are: Museum of Comparative Zoology, Cambridge; Carnegie Museum, Pittsburgh; United States

National Museum, Washington; California Academy of Sciences, San Francisco; San Diego Society of Natural History, San Diego; American Museum of Natural History, New York; and Field Museum of Natural History, Chicago. On the same or similar scores, my personal gratitude is due to the following individuals: Dr. Charles W. Richmond; Mr. Outram Bangs; Mr. W. E. Clyde Todd; Dr. Alexander Wetmore; Mr. Harry S. Swarth; Dr. Louis B. Bishop; Mr. Griffing Bancroft; Mr. John E. Thayer; Mr. Donald R. Dickey; Mr. Clinton G. Abbott; Mr. Allen L. Chickering; Mr. J. H. Fleming; Mr. Adriaan J. van Rossem; Dr. Theodore S. Palmer; Mr. James Lee Peters; Mr. J. H. Riley; Mr. C. O. Reis; Mr. Laurence M. Huey; Mr. George Willett; Mr. Ludlow Griscom; Dr. Robert C. Murphy; Mr. Frederick C. Lincoln; Mr. F. Nutter Cox; Mr. Wright M. Pierce; Dr. Charles H. Townsend; Dr. Jean M. Linsdale.

The field work in Lower California as carried on by the Museum of Vertebrate Zoology has been expedited in many ways by the friendly attitude on the part of both the District officials in Lower California and those of the Mexican Government in Mexico City and San Francisco. I wish, in particular, to acknowledge courtesies from Dr. Alphonso L. Herrera, Director de Estudios Biológicos, Mexico City.

From among the regular staff of this Museum, I must first name Mr. Chester C. Lamb, as having been the chief participant in the field work in Lower California and to whose acumen as a collector we owe the capture of many rarities and the discovery of some birds new to that territory, as acknowledged here and there through the subsequent text. Then Miss Margaret W. Wythe, in arranging and cataloguing the collections, has assisted importantly in their systematic handling. Furthermore, the accompanying maps are of her drawing.

DIFFERENTIATION AREAS

Analysis of the mass of distributional data given in the main part of the present paper leads to the recognition of a number of separate areas in Lower California each of which possesses species or subspecies, or both, peculiar to itself. In each area the differentiation of these characterizing species and subspecies (to be termed differentiates) appears to be directly correlated with certain conditions having to do with degree and duration of isolation of their populations during passed time together with environmental peculiarities involving climate, shelter, and food. But there has been marked irregularity of results in the several areas; and this circumstance, of varying effectiveness, would seem to provide opportunity for determining some of the factors involved. Before further discussion, I will designate the ten differentiation areas which seem to me discernible within the territory of Lower California and list the subspecies and species of land birds which appear to belong characterizingly to each.

1. Subspecies and species of land birds believed to have been differentiated within the CAPE DISTRICT of Lower California:

<i>Lophortyx californica</i> <i>achruster</i>	<i>Amphispiza bilineata</i> <i>bangsi</i>
<i>Columba fasciata</i> <i>vioscae</i>	<i>Aimophila ruficeps</i> <i>sororia</i>
<i>Falco sparverius</i> <i>peninsularis</i>	<i>Pipilo maculatus</i> <i>magnirostris</i>
<i>Otus asio</i> <i>xantusi</i>	<i>Pipilo fuscus</i> <i>albigula</i>
<i>Bubo virginianus</i> <i>elachistus</i>	<i>Richmondia cardinalis</i> <i>ignea</i>
<i>Glaucidium gnoma</i> <i>hoskinsii</i>	<i>Pyrrhuloxia sinuata</i> <i>peninsulae</i>
<i>Micropallas whitneyi</i> <i>sanfordi</i>	<i>Passerina versicolor</i> <i>pulchra</i>
<i>Crotophaga sulcirostris</i> <i>pallidula</i>	<i>Progne subis</i> <i>hesperia</i>
<i>Dryobates scalaris</i> <i>lucasanus</i>	<i>Tachycineta thalassina</i> <i>brachyptera</i>
<i>Balanosphyra formicivora</i> <i>angustifrons</i>	<i>Lanius ludovicianus</i> <i>nelsoni</i>
<i>Centurus uropygialis</i> <i>brewsteri</i>	<i>Vireo solitarius</i> <i>lucasanus</i>
<i>Colaptes chrysoides</i> <i>chrysoides</i>	<i>Vireo huttoni</i> <i>cognatus</i>
<i>Phalaenoptilus nuttallii</i> <i>dickeyi</i>	<i>Dendroica erithachorides</i> <i>castaneiceps</i>
<i>Chordeiles acutipennis</i> <i>inferior</i>	<i>Geothlypis beldingi</i> <i>beldingi</i>
<i>Basilinna xantusi</i>	<i>Toxostoma cinereum</i> <i>cinereum</i>
<i>Myiarchus cinerascens</i> <i>pertinax</i>	<i>Heleodytes brunneicapillus</i> <i>affinis</i>
<i>Sayornis nigricans</i> <i>brunnescens</i>	<i>Sitta carolinensis</i> <i>lagunae</i>
<i>Myiochanes richardsonii</i> <i>peninsulae</i>	<i>Baeolophus inornatus</i> <i>cineraceus</i>
<i>Empidonax difficilis</i> <i>cineritius</i>	<i>Psaltriparus minimus</i> <i>grindae</i>
<i>Aphelocoma californica</i> <i>hypoleuca</i>	<i>Auriparus flaviceps</i> <i>lamprocephalus</i>
<i>Icterus cucullatus</i> <i>trochiloides</i>	<i>Polioptila caerulea</i> <i>obscura</i>
<i>Carpodacus mexicanus</i> <i>ruberrimus</i>	<i>Polioptila melanura</i> <i>abbreviata</i>
<i>Junco bairdi</i>	<i>Turdus confinis</i>

2. Subspecies believed to have been differentiated within the SAN PEDRO MARTÍN DISTRICT (including the so-called SAN QUINTÍN DISTRICT):

<i>Oreortyx picta confinis</i>	<i>Pipilo fuscus senicula</i>
<i>Lophortyx californica plumbea</i>	<i>Lanius ludovicianus grinnelli</i>
<i>Dryobates villosus scrippsae</i>	<i>Toxostoma cinereum mearnsi</i>
<i>Dryobates scalaris eremicus</i>	<i>Toxostoma crissale trinitatis</i>
<i>Balanosphyra formicivora martirensis</i>	<i>Heleodytes bruneicapillus bryanti</i>
<i>Centurus uropygialis cardonensis</i>	<i>Thryomanes bewickii charienturus</i>
<i>Colaptes cafer martirensis</i>	<i>Sitta carolinensis alexandrae</i>
<i>Colaptes chrysoides brunescens</i>	<i>Sitta pygmaea leuconucha</i>
<i>Sayornis saya quiescens</i>	<i>Baeolophus inornatus murinus</i>
<i>Sayornis nigricans salietaria</i>	<i>Penthestes gambeli atratus</i>
<i>Aphelocoma californica obscura</i>	<i>Psaltiriparus minimus melanurus</i>
<i>Junco oreganus townsendi</i>	<i>Chamaea fasciata canicauda</i>
<i>Aimophila ruficeps lambi</i>	<i>Polioptila melanura californica</i>
<i>Pipilo maculatus umbraticola</i>	<i>Sialia mexicana anabelae</i>

3. Subspecies believed to have been differentiated within the SAN IGNACIO DISTRICT, in the lower waist of the peninsula:

<i>Otocoris alpestris enertera</i>	<i>Geothlypis beldingi goldmani</i>
<i>Passerculus rostratus halophilus</i>	<i>Toxostoma lecontei arenicola</i>
<i>Amphispiza belli cinerea</i>	<i>Thryomanes bewickii cerroensis</i>
<i>Melospiza melodia rivularis</i>	<i>Polioptila melanura margaritae</i>
<i>Pipilo fuscus aripolius</i>	

4. Subspecies and species believed to have been differentiated within the COLORADO DESERT DISTRICT, though some of them not necessarily or probably within the territory included within the northeastern boundaries of Lower California:

<i>Lophortyx gambelii gambelii</i>	<i>Passerculus rostratus rostratus</i>
<i>Otus asio gilmani</i>	<i>Melospiza melodia saltonis</i>
<i>Dryobates scalaris cactophilus</i>	<i>Pipilo aberti</i>
<i>Centurus uropygialis uropygialis</i>	<i>Piranga rubra cooperi</i>
<i>Colaptes chrysoides mearnsi</i>	<i>Dendroica aestiva sonorana</i>
<i>Phalaenoptilus nuttallii hueyi</i>	<i>Toxostoma lecontei lecontei</i>
<i>Otocoris alpestris leucansiptila</i>	<i>Toxostoma crissale crissale</i>
<i>Agelaius phoeniceus sonoriensis</i>	<i>Polioptila melanura melanura</i>

5. Subspecies believed to have been differentiated in the SAN DIEGO DISTRICT, altogether north of the United States boundary, but which extend a greater or less distance into Lower California, even as far in some cases as 30° latitude:

<i>Otus asio quercinus</i>	<i>Melospiza melodia cooperi</i>
<i>Otocoris alpestris actia</i>	<i>Pipilo maculatus megalonyx</i>
<i>Agelaius phoeniceus neutralis</i>	<i>Pipilo fuscus crissalis</i>
<i>Aimophila ruficeps canescens</i>	<i>Geothlypis trichas scirpicola</i>

6. Subspecies believed to have been differentiated within the SIERRA JUÁREZ DISTRICT:

Junco oreganus pontilis

7. Subspecies and species believed to have been differentiated on GUADALUPE ISLAND:

<i>Polyborus lutosus</i>	<i>Pipilo consobrinus</i>
<i>Colaptes cafer rufipileus</i>	<i>Salpinctes obsoletus guadeloupensis</i>
<i>Carpodacus amplus</i>	<i>Thryomanes brevicauda</i>
<i>Junco insularis</i>	<i>Corthylio calendula obscurus</i>

8. Species and subspecies believed to have been differentiated on the SAN BENITO ISLANDS:

<i>Carpodacus mgregori</i>	<i>Passerculus rostratus guttatus</i>
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9. Subspecies believed to have been differentiated on LOS CORONADOS ISLANDS:
Melospiza melodia coronatorum

10. Subspecies which are believed to have been differentiated on the SANTA BARBARA ISLANDS, hence entirely to the northwestward of the confines of Lower California, but whose ranges extend to include certain islands, or even the mainland, along the northwestern coast of the peninsula:

<i>Carpodacus mexicanus clementis</i>	<i>Vermivora celata sordida</i>
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The bird life of the entire peninsula of Lower California, as long ago indicated by Merriam (1892) and Allen (1893), and as more recently demonstrated by Nelson (1921), is essentially of northern relationships rather than Mexican or Tropical. In other words, it may be said with confidence that the peninsula as a whole has been populated by more or less remote as well as recent invasions, by way of its basal territory, from California, Arizona, and Sonora.

A way to test this matter is to examine the differentiates which characterize the area farthest sequestered. This area is, of course, the Cape District. There are forty-six forms listed above as having originated in this area; and in all these cases but three the pioneer ancestors can most reasonably be thought of, in my opinion, as having arrived from the north, at one time or another, over continuous land, rather than from across the Gulf to the eastward.

These three exceptions in the Cape avifauna (*Crotophaga sulcirostris pallidula*, *Basilinna xantusii* and *Dendroica erithachorides castaneiceps*) belong to the Tropical life-zone and were most probably originally established by vagrants from across the water. Furthermore, vagrants of probably southern route, which are known to have arrived in the peninsula (but which have not become established) are only two, namely, *Compsothlypis graysoni* and *Euthlypis lachrymosa tephra*. The numerous other recent vagrants recorded from Lower California can all be accounted for as coming in from the north; the process now is thus likely quite as it has been in the past, whenever not interrupted by mid-peninsular submergence.

There is no differentiate in any other area than the Cape District that is not of positively northern affinities (that is, Californian or Sonoran). Several other of the differentiates in the Cape District, in addition to the three named above, have, I am aware, been listed as "Tropical." These (notably *Micropallas whitneyi sanfordi*, *Richmondia cardinalis ignea*, *Pyrrhuloxia sinuata peninsulae*, and *Passerina versicolor pulchra*) could easily have come in over the Colorado Desert route, especially during cycles of unusually warm climate, becoming established then on permanent basis at the lower end of the peninsula where the climate at low altitudes has doubtless remained most continuously of Tropical warmth, favorable to the several species in question. To repeat the idea, 94 per cent of the differentiates in the Cape District were antecedently Boreal or Austral in origin, as were all the differentiates in the remaining nine districts of Lower California.

The area next most prolific of differentiates, the San Pedro Mártir District, including much of the northern, most elevated part of the peninsula, has twenty-eight forms peculiar to it. Most of these are races of Boreal or Upper Austral species—links in continuous series from the north, terminal races or else with further differentiates to the south, in the San Ignacio District or in the Cape District, or in both. (See, for example, the accompanying maps for *Lophortyx*, *Junco*, *Aimophila*, *Pipilo*, *Lanius*, *Thryomanes*, *Sitta*, and *Baeolophus*.) In one case, *Toxostoma cinereum mearnsi*, I think we see the results of a secondary invasion, northward from the Cape District, of a species differentiated in the latter area from an ancestor still more precedently of Sonoran origin. The structural features of the series of thrashers within which *T. cinereum* lies, coupled with their distributional occurrence, indicate this.

The area I here call the San Ignacio District, using the term proposed by Bancroft (1926) but not with the same significance, is interlying and poorly developed as regards endemic differentiates. There are nine of them. Six are terminal in series from the north; two (*Pipilo fuscus aripoli* and *Polioptila melanura margaritae*) are intermediate steps between San Pedro Mártir and Cape forms of species continuously distributed up and down the peninsula; and one (*Geothlypis beldingi goldmani*) is of closest affinity with a Cape District differentiate.

Immediately to the north of the San Pedro Mártir District proper is a mountain mass showing, among birds, just one Boreal differentiate,

Junco oreganus pontilis. Otherwise, this weakly marked differentiation center, the Juárez District, lies predominantly within the influence of the San Pedro Mártir District. It is to be observed here that my conception of the territory involved in the latter district extends to include the entire gamut of species, Austral as well as Boreal, which appear to have come under the peculiar "humid-desert" type of climate conditioned, seemingly, by the presence and position of the lofty San Pedro Mártir range. The lowlands west to the seacoast and even the nearby islands plainly fall within this climatic area.

At the northeast, in the potent Colorado Desert District, we find entering the territory of Lower California a number of Sonoran birds, some of them in far-differentiated form—full species, like *Pipilo aberti*, *Toxostoma lecontei*, and *Toxostoma crissale*. The latter two, and others, have evidently given origin secondarily (accompanying or following southward spreading of their populations) to near-related races in the San Pedro Mártir, the San Ignacio, and even the Cape District. Quite as interesting as the cases in which southward spreading and subsequent differentiation *has* occurred, are those cases in which the process has *not* taken place; for example, *Lophortyx gambelii*. The nature of the limiting barrier for this quail has not as yet been suggested.

At the northwest, influence upon the bird life of the adjacent portion of Lower California is seen to be exerted appreciably from the San Diegan District of southwestern Upper California. Eight essentially San Diegan differentiates, all of the Austral life-zone, penetrate more or less distance south, in four cases on the lower coastal strip clear through the San Pedro Mártir District (in its "San Quintín" section).

Insularity in passed time probably had a good deal to do in at least hastening the process of differentiation in the Cape District proper. At the present stage of land emergence or submergence none of the resulting islands possesses the area or the altitude or the wide range of ecologic conditions which doubtless pertained to the antecedent Cape District island. None of the existing islands shows, as regards birds, anywhere near the amount of racial difference that characterizes the Cape avifauna.

Guadalupe is the most remote of the many Lower Californian islands (for full descriptions of all these, see Nelson, 1921); it is of volcanic formation and was never connected with the mainland; it

is of fair size (22 by 6 miles) and considerable altitude (up to 4500 feet); and it has, or originally had, a goodly number of diverse ecologic associations, including forest. All of its land birds must have reached it as vagrants, the eight differentiates in more or less remote times. Of the eight species thus represented, two (*Junco insularis* and *Corthylus calendula obscurus*) are Boreal, four (*Colaptes cafer rufipileus*, *Pipilo consobrinus*, *Salpinctes obsoletus guadeloupensis*, and *Thryomanes brevicauda*) may be considered essentially Upper Austral, and two (*Carpodacus amplus* and *Polyborus lutosus*) are likely Lower Austral, the last-named even Tropical, in zonal origin.

Despite its location 135 miles from the nearest mainland, Guadalupe Island, as seen from the evidence detailed in the present contribution, is receiving from year to year vagrant delegates from a wide range of mainland species. Only now and then do the ecologic conditions there, in coincidence with sufficient numbers of arriving vagrants of a given species, plus other critical factors of persistence, permit of colonial establishment. Such has occurred in the cases of *Loxia* and *Sitta*, though so recently as to have resulted in no appreciable degree of differentiation. In the genera represented by Guadalupe differentiates it is significant for their origin to recall the records, elsewhere specified, of waifs of *Salpinctes* and *Corthylus* on shipboard off the west coast of Lower California.

The San Benito group of islands is next to Guadalupe in importance for differentiation of birds. But the San Benitos are small, with few ecologic niches; and we find but two birds among the small number established upon them which are appreciably different from their congeners elsewhere. One of these (*Carpodacus mcgregori*) has been found also on the nearby Cedros Island, but whether or not as more than a vagrant there is not known.

Los Coronados Islands, of four members small in size, and only some seven miles off the northwestern seacoast, are to be recognized as comprising a differentiation center, because of the existence there of a peculiar race of the Song Sparrow (*Melospiza melodia*). This is the only instance in which any of the islands fringing Lower California have been reached or, rather, permanently occupied by this plastic type of bird. Its restricting ecologic requirements doubtless account for this exclusiveness, which is manifest also over the greater part of the peninsular mainland.

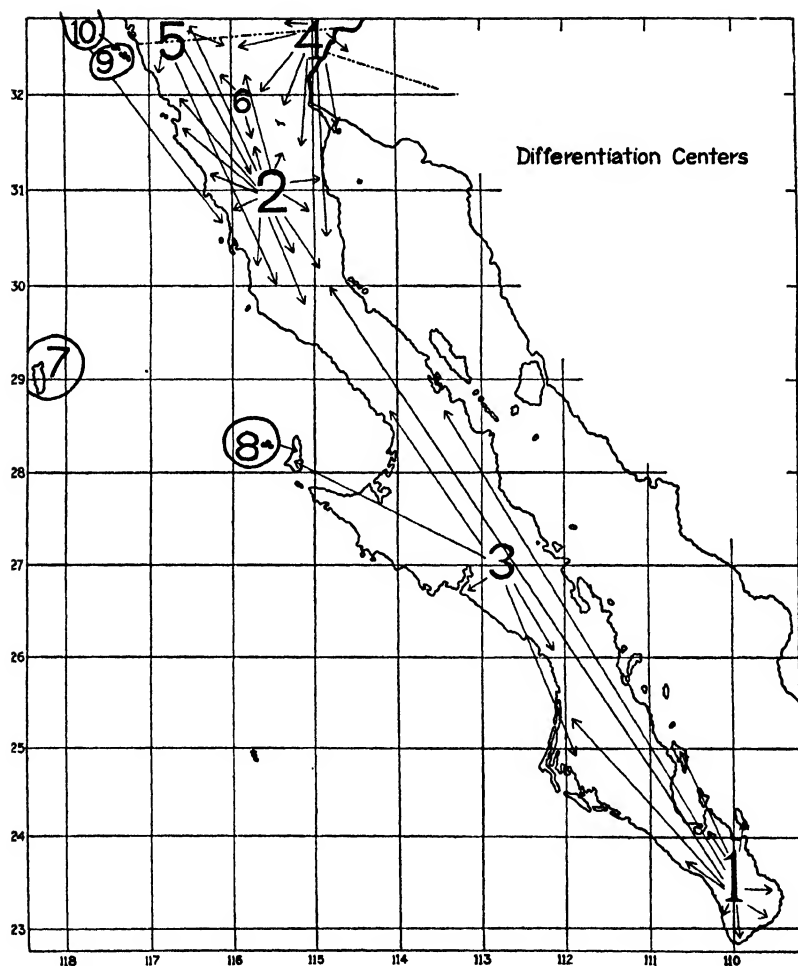


Fig. 1. Differentiation centers as having likely influenced the avian history of Lower California: 1, Cape District; 2, San Pedro Mártir District; 3, San Ignacio District; 4, Colorado Desert District; 5, San Diegan District; 6, Sierra Juárez District; 7, Guadalupe Island; 8, San Benito Islands; 9, Los Coronados Islands; 10, Santa Barbara Islands.

A race of Linnet (*Carpodacus mexicanus*) separate from that of the adjacent mainland also occupies Los Coronados Islands. But its affinities are clearly with the Linnets of the Santa Barbara group of islands to the northwestward, off southern Upper California. Another product of what may be termed the Santa Barbara Island differentiation area is the peculiar warbler, *Vermivora celata sordida*, which reaches not only to certain of the coastal islands at the north but to a few known mainland localities close to the seacoast even as far south as 30° latitude. These stations, both insular and mainland, show obvious similarities of environment, both vegetational and climatic, to such an island of the Santa Barbara group as San Clemente.

Curiously, not one of the numerous Lower Californian islands in the Gulf has as yet been shown to possess an avian differentiate, although several of them do possess endemic members of other classes of vertebrates. However, cases of differentiation among the most sedentary types of birds may yet be discovered, when extensive collections of satisfactory material have been studied.

Reviewing the differentiation areas of Lower California, it can be said that the Cape District appears to have acted most potently with respect to bird life, as indicated on both the criterion of numbers of differentiates recognizable and that of great amount of difference characterizing some of them (for example, *Basilinna*, *Junco*, *Turdus*). The San Pedro Mártir District comes next on the former criterion, Guadalupe Island on the latter criterion. Important factors in the development of an area as a separate center of avian differentiation are, I should say, as follows: (1) Presence of many and diverse ecologic niches; (2) presence of marked climatic peculiarities as contrasted with the territories whence the species are being derived by the process of pioneering; (3) degree of isolation by barriers of water or of terrain inhospitable to the existence of those species which do find favorable living conditions in the area in question; (4) size of the area in question, or rather, of the portions of it furnishing the different ecologic niches. (A mere dab of a certain niche, as comprised in marshland or forest of but a few acres' extent, does not often suffice to support permanent populations of appropriate species, no matter how well suited to their requirements.)

A differentiation center of strong potency will produce differentiates some at least of which will penetrate far beyond the confines of the immediately effective area. Some of the species are prolific

of individuals, aggressive, and adaptable with respect to being able to thrive under quite a range of ecologic conditions. These, in continually radiating streams of individuals, involving successive generations in relatively short series, often extend unmodified along routes of least environmental resistance even quite through adjacent differentiation areas. Especially is this the case where the neighboring areas are of weak potency. The accompanying map of Lower California (fig. 1), studied in connection with the detailed statements of distribution in the text under the general accounts of the species, provides numerous illustrations of the principles here stated.

SIGNIFICANCE OF FAUNAL ANALYSIS FOR GENERAL BIOLOGY

Is there any far-reaching significance, for general biology, in the sort of faunal exploration which results in the describing and listing of species and subspecies and the working out in detail of their ranges? Yes, I would answer with no hesitation whatsoever. For, in dealing with the ranges of animals, more particularly in determining and examining the limits of their habitats, in ascertaining the diagnostic characters of the species and more especially of the subspecies, and in discovering correlations between these characters and various factors of the environment, we are scrutinizing evolution now *in progress*.

Among the numerous races of Upper and Lower Californian birds, for example, we are able to pick out, here and there, practically every appreciable stage in the general differentiation process, from neighboring stocks differing so slightly from one another as to show only faint departures when long series of individuals are averaged, to the fully differentiated species in the true, or Linnaean sense, namely, as set off sharply by itself without there being any individuals that can be interpreted as even hybrids with a neighboring species. Where connectants exist, intergrades we call them in our present system, the races thus *incompletely* differentiated we call subspecies. There is no difference, genetically, between the subspecies and the species, or in any other way save for this one, of more or less casual circumstance, intergradation, and, usually, of the correlated lesser amount of difference between allied subspecies.

Much objection has been registered of late from many lay, and curiously some professional, sources against the recognition of subspecies in nomenclature, on the ground that they are difficult of discernment; and their recognition, it is urged, is therefore of no practical utility. But, I ask, is the histologist, or the embryologist, or the bacteriologist expected to confine his labors within limits easily comprehended by the laity? Why, then, should the faunal zoologist be expected to keep *his* investigations within any such bounds? Personally, as a student of vertebrate speciation I am only mildly interested in the full, Linnaean species, because the full species has passed the really significant stage in its career: I am intensely interested in the barely discernible subspecies, because *it* is in the critical, formative stage, and there is a good chance that I may learn something of the causes and essential conditions of its differentiation.

To my mind, then, in the study of subspecies as contrasted with the so-called full species we are dealing with the earliest stages in the phylogenetic process. In other words, subspecies are the fundamental elements which, in any really significant systematic and faunistic investigation, must receive primary recognition. The more accurately and acutely we can train our senses and instruments upon the detection of subspecies, the better understanding will we gain of their nature and the processes producing them.

Recalling now the maps of Upper and Lower California, and having in mind the ranges of the avian inhabitants of that continuous territory, in so far as knowledge of them has accumulated, we observe some significant things. In many of the groups of wide representation we find that the amount of difference displayed by the geographic forms varies directly with the degree of spatial separation.

For example, take the bird group containing the California Linnet, genus *Carpodacus*: In comparison with the mainland race, the stock on Los Coronados Islands, seven miles offshore, is appreciably but not constantly nor conspicuously different. The linnets of the San Benito Islands, 40 miles from the nearest mainland shore, show somewhat greater amount of, and fairly constant, differences from the birds of the mainland, while the race on Guadalupe Island, 135 miles from the opposite mainland, is most different of all, so widely different and so constantly so, that it is designated as a full species. The features which characterize this Guadalupe species as compared with the mainland linnet are much greater size, especially of bill and skull, longer legs, but relatively shorter wing bones, and shorter keel

of sternum (Lucas, 1891). These latter, skeletal differences, as pointed out by Lucas, reflect loss in wing power. This tendency reaches its extreme on certain remote Pacific islands where, in other families of birds, a condition of complete flightlessness is found. Before man's advent the land birds on the islands were without enemies and, their confines being limited, there was little or no need or opportunity for quick or prolonged flights.

Now, going southward from the San Francisco Bay region through California and the northern two-thirds of the mainland peninsula of Lower California, the linnets are (to me) indistinguishably the same all the way. Let it be noted that there are no barriers anywhere in this long extent of territory to prevent free interbreeding of the birds from place to place and progressive intermingling from generation to generation. South of latitude 30°, however, a noticeable change in the characters of the birds becomes apparent, until in the southern half of the peninsula an easily definable mainland subspecies exists, of smaller size and brighter color. In this latter case, where no water barrier interposes itself, the factor of long *distance* has become influential as an effective form of isolation, permitting differentiation of the remote stocks despite commingling over intervening territory. The long *time* involved, in combination with long distance, here compensates for lack of an impassable barrier. Also, there are markedly different climatic areas concerned.

To put the matter perhaps more concisely, separation of descent lines, even though close together spatially, by impassable barriers, brings rapid differentiation, relatively speaking; whereas, *without* the intervention of positive barriers, there is required a long interval of distance or a very long time, most effectively both, for the impress upon two stocks, of subspecific characters.

I will mention just one other, out of the numerous cases which in the aggregate force one to recognize the potency of geographic isolation in the initiation of divergent evolution. The linnets just cited belong as a rule to regions of warm climate; their metropolis is toward the south. The Spotted Towhees, of the genus *Pipilo*, a rather more Boreal group than the linnets, occupy territory from British Columbia to as far south as the tip of the Lower California peninsula, but not continuously; they are interrupted in their distribution. Mainland races, it is true, succeed one another gradually south from British Columbia along the Pacific coast, until the southernmost in the continuous series is found in the San Pedro Mártir district.

There the continuity ceases. South of that, evidently because of the unfavorable floral and climatic conditions, there are no Spotted Towhees at all on the Lower California peninsula until the Sierra de La Laguna are reached, in the Cape district; there, in a small mountainous area, exists a race of Spotted Towhee considerably different from the race of the San Pedro Mártir district. The amount of difference is greater than in the case of the *linnet* of the Cape region. Also, there is a wide, uninhabited geographic hiatus in the case of the Spotted Towhee, such as does not exist in the case of the *linnet*.

Only one of the Lower California islands is inhabited by the Spotted Towhee, Guadalupe, 135 miles offshore, whose high and cold summit is most nearly of all of them Boreal or northern in its climatic features. And the form of Spotted Towhee of Guadalupe Island is even more different from the Upper Californian towhee than is the one in the Cape district.

It is to be observed in these and several paralleling cases that the most nearly similar races in a series are not located within the same differentiation area, nor yet in remote differentiation areas, but in separate and adjacent differentiation areas, this being essentially "Jordan's law," one of the several outstanding laws of animal distribution, of great significance for evolutionary process.

Another generalization with important implications comes from observations upon subspecific behavior where a number of plastic vertebrate types are found in one differentiation area. I will refer in particular to my ornithological findings in the peculiar climatic area comprised in the San Pedro Mártir section of northern Lower California. Here, between the crest of the Sierra San Pedro Mártir and the Pacific, is what may be termed a *humid desert*; that is to say, there exists a region of meager rainfall but of high atmospheric humidity. Fog or cloudiness is frequent over an intensely dry terrane!

The notable thing is that this combination of conditions brings similar modifications (deepened coloration, certain proportions of wing and tail, lesser size of bill, etc.) in various birds which are very remotely related to one another phylogenetically; for example, in certain flycatchers, finches, and woodpeckers. In other words, subjection of very different stocks to the same peculiar set of critically important conditions has brought parallel modifications in certain functions and structures. The inherited variations have not been

random, but have been directed—orthogenetic. Hence, I think, sub-specific characters, either intrinsically themselves or as, perhaps sometimes, linked, only, with others that are, must be of *worthy* sorts in the racial struggle for existence—not, ordinarily, indifferent or useless ones.

And so it is by the accumulation of group studies of this sort that the student of faunas finds himself led to interpretations of seemingly great significance in the problem of species formation. The same or similar interpretations, I believe, extend to the origin of the larger groups, as well as to all the ultimate differentiations, up to man himself, and all his races.

We have heard a great deal of late years in regard to evolution through mutation. A long list of papers and books has been written relative to germinal constitution and variations, wherein, if not directly so implied in the title, the reader is induced to believe that the problem of evolution of species is being immediately dealt with. To my mind, this assumption involves a most astonishing illogicality. Of course it goes without saying that change of species through time could not take place without the circumstance of inheritance; but neither could it without such qualities, features, or processes as assimilation, metabolism, hormone production, growth, cell division, reproduction in the large. Each and all of these things and many others are vital to the existence and persistence of living beings; but they may, indeed probably, have nothing directly to do with change of specific type through time.

In regard to all these matters it is important to know, to the farthest detail, the nature of the mechanisms and processes involved. But the set of facts having to do with inheritance is not properly to be confused with, or to be thought of as supplanting, those concerned directly with the origination of species. No matter *how* heritable variations in individuals may arise, no evolution in the phylogenetic sense can have taken place until said variations have been subjected to the drastic process of trial for survival. This endurance test is imposed by environments. And the critical factor for divergence of stocks under differing environments is isolation. Otherwise there is swamping, with resulting uniformity of populations, instead of divergence. Of course, the amount and rapidity of effect by environment is immediately limited by the conservatism of the organism—the animal will stand only so much ecologic pressure. Its inheritance prescribes a certain limit of modifiability; but counting that in—

then, with a more or less segregated population, whose variations are of the inherited sort, the Darwinian factor of *selection* comes into play. These heritable variations of selectional value are of small compass, certainly not of large amount, as the old "mutation" concept had it.

By the action of selection a population is able to accommodate itself to conditions as they change; it becomes less liable to outright extinction should conditions change abruptly. Animal adaptation, so-called, is merely the demonstration of a capacity to survive under conditions at the moment existing—just that! And animals do just as little adaptation as they can and "get by." Inertia is a characteristic of the organism. The *direction* of such modifications as *are* acquired is determined by the course of environmental history.

The accumulating experience of the field naturalist is bringing conviction that the incipient species in nature, the subspecies, owes its origin to a process, on a vast scale, of trial, discard, and preservation, of individuals, and of groups of individuals comprising populations, which populations from generation to generation are thereby rendered more nearly adjusted to such environments as they can endure at all. But environments themselves never stabilize; they are changing, proliferating, evolving continually. A balanced state of perfect adaptation of the organism can never be attained, but only continually approached, such approach being forced, under penalty of extinction.

It seems to me, then, that the problem of the origin of species ought to be dissociated largely from the problems of inheritance. The problem of speciation would seem to lie much more nearly to the provinces of the geographer and climatologist than to that of the geneticist. The studies of the systematist, if he be also a field zoologist, in his definition of minor species and of subspecies, and of the geographer, may be looked to, accordingly, if properly correlated, to bring an improved understanding of the conditions, methods, and results of evolution, more especially as regards the higher vertebrate types.

GAZETEER OF LOCALITIES

Unexpected difficulty was experienced in handling published records of birds from Lower California for the reason that many place names are duplicated in different parts of the territory. Thus, there are at least four places called Santo Domingo, eight that are called San José, three called Santo Tomás, three Rosarios, two Victoria Mountains, and so on. Some explorers have taken pains to provide maps showing their itineraries and have listed explicitly the localities they have visited. But some others have not done so; and rarely have subsequent authors, especially systematic revisers of groups of birds, taken the trouble to indicate the district or latitude in which the localities they give are located.

A great number of localities shown on various maps of Lower California as if populated towns are either mere topographic features without a human dwelling, now or ever, within a score of miles, or else they are sites of villages of the mission days, now long extinct. Then, too, new localities are springing up, as a result of mining or of tourist activities. New roads are being built and old place names of the general vicinity are often transferred to new locations along them.

The geography of Lower California, which must be mastered in order correctly to handle the facts of animal distribution, is thus becoming a more and more complicated matter. To help the student of the future in some measure, the following gazeteer is offered as a result of the present author's experience. This alphabetic list includes only those place names that have been used in published literature, or are used in the present paper, to designate occurrences of bird species or to outline their ranges. This is not a general gazeteer; no matter how important other localities may be in other connections they do not find place here.

A great number of maps of Lower California have been published. The most accurate and generally useful are those comprised in the series of charts issued for navigational purposes by the United States Hydrographic Office under the authority of the Secretary of the Navy. These, however, show chiefly coastal localities. Other maps, also useful in finding localities which have been published in ornithological writings, are as follows:

Baja California, No. 3, Escala 1:2,000,000; [issued by] Secretaría de Agricultura y Fomento, D. F. Mexico; 2ª Edición, 1922.

Baja California, "Norte" and "Sur"; 1:1,000,000; Provisional Edition; American Geographical Society of New York, 1924.

Reconnaissance Map of Lower California, Mexico; comprising Plate 35 in Nelson's (1921) report.

The "Brandeggee map" accompanying Bryant's (1889b) "Catalogue."

The "Brewster map" in Brewster (1902).

The "Townsend map" in Townsend (1916).

A few of the localities here listed are not to be found on any map that I know of, in which case their position is described as accurately as is now possible, with relation to places that are well known.

Certain islands and places on islands have been ascribed in ornithological literature to Lower California which properly do not belong to this territory at all, either politically, or faunally as defined in my present paper. Thus, the Revillagigedo Islands (Clarión, Roca Partida, Socorro, and San Benedicto) are not Lower Californian; and neither are the following in the Gulf: Georges, Patos, Tiburón, Pelican, San Estéban, San Pedro Mártir, and San Pedro Nolasco. These latter are all on the eastern side of the deepest depression in the Gulf trough and belong to Sonora.

In the following gazeteer, the references to maps are primarily to those which are assumed to be most immediately accessible to ornithologists, therefore to those maps accompanying general scientific papers, if not restrictedly ornithological reports. Thus the map accompanying Nelson (1921) is usually cited first, or alone, even though a given locality might be shown quite as well, or even better in relation to its surrounding territory, on some other, less easily obtained map. In matter of spelling, which is often variable, I have usually followed the United States hydrographic charts in so far as localities are covered by them. No one should venture to deal with distributional matters concerning Lower California without having at hand at least the "No. 1006" of this series of charts.

I wish to acknowledge here helps in the matter of the spelling and proper accenting of names, from Professor Herbert E. Bolton.

Abreojos Point: on Pacific coast, near lat. $26^{\circ} 42'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1310, 1294, 1493.

Agua Escondida: a *Xantus* locality in the southern part of the Cape district, possibly the one inland from the Pacific seacoast at lat. $23^{\circ} 9'$. See 'Cerro de las Aguas Escondidas' of U. S. Chart No. 1664.

- Agua Grande: interior locality near lat. $26^{\circ} 30'$ and about due north of La Purísima. Nelson, 1921, p. 36, pl. 35.
- Aguaita: situated interiorly from west coast close to lat. 30° ; between El Rosario and San Fernando. Huey, 1926, p. 348.
- Aguaje del Sauce: spring and camping place west of base of Sierra San Pedro Mártir, 2600 feet altitude, near lat. $30^{\circ} 53'$. Am. Geog. Soc. "Norte" map.
- Agua Verde Bay: Gulf side of the peninsula, lat. $25^{\circ} 31'$. Nelson, 1921, pl. 35. U. S. Charts Nos. 1006, 850.
- Alamo: old mining center on interior western drainage close to lat. $31^{\circ} 35'$. Nelson, 1921, p. 16, pl. 35; Mexican map Baja California No. 3.
- Alamo River: a northward flowing distributary of the Colorado River, crossing the United States boundary near Mexicali; also called Salton River. U. S. Geol. Surv. "Salton Sink" map.
- Alijos Rocks [or Los Alijos Rocks]: Pacific Ocean, about lat. $24^{\circ} 57'$, long. $115^{\circ} 45'$. U. S. Charts Nos. 1006, 1687.
- Angel de La Guardia [or Guarda] Island: in the Gulf, lat. $29^{\circ} 15'$. Nelson, 1921, p. 93, pl. 35; U. S. Charts Nos. 1006, 620.
- Angeles Bay: see Los Angeles Bay.
- Arroyo La Encantada: see La Encantada.
- Arroyo Nuevo York: on lower western drainage about 15 miles due south of Santo Domingo, and near lat. $30^{\circ} 35'$, altitude about 200 feet; at mouth of cañon of same name (see Nelson, 1921, p. 22).
- Asunción Island: Pacific side, lat. $27^{\circ} 6'$. Nelson, 1921, p. 89, pl. 35; U. S. Charts Nos. 1310, 1268.
- Ballandra [Port]: see Puerto Ballandra.
- Ballenas Bay: Pacific side, lat. $26^{\circ} 45'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1310.
- Banda Point: see Point Banda.
- Black Mountain [or Black Butte or Cerro Prieto]: hill on western side of Colorado delta, near Volcano Lake, lat. $32^{\circ} 25'$. Murphy, 1917, pl. I; U. S. Geol. Surv. "Salton Sink" map.
- Bluff Point: Gulf side, lat. $29^{\circ} 35'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 619.
- Bomba: see La Bomba.
- Bruce's Ranch: on Hardy River, in Colorado delta below junction with Pescadero Slough. Stone and Rhoads, 1905, p. 676; U. S. Geol. Surv. "Salton Sink" map.
- Burro Cañon [or Cañón del Burro]: an Anthony locality on Pacific drainage, some 25 miles northeast of Ensenada. Doubtless "El Burro" of Mexican map Baja California No. 3; see also Nelson, 1921, p. 48.
- Cabo San Lucas: see Cape San Lucas.
- Caduana: in Cape district, a few miles south of Miraflores, about lat. $23^{\circ} 23'$. Mexican map Baja California No. 3.
- Calamahué [or Calamajué]: old mission site interiorly toward eastern side of the peninsula at about lat. $29^{\circ} 40'$. Nelson, 1921, p. 27, pl. 35.
- Calmalli: interior mining center at lat. $28^{\circ} 15'$. Nelson, 1921, p. 31, pl. 35.
- Cañon San Juan de Dios: on western drainage to eastward of El Rosario, about lat. $30^{\circ} 7'$. Nelson, 1921, pl. 35; Huey, 1926, p. 348.
- Caparote Butte: on southwestern side of Pattie Basin, about lat. $32^{\circ} 5'$. Murphy, 1917, pl. I.
- Cape Colnett: on Pacific coast, near lat. $30^{\circ} 58'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1149, 1045.

- Cape San Lázaro: on Pacific coast, lat. $24^{\circ} 47'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 621, 1493.
- Cape San [often written "St."] Lucas: extreme southern tip of the peninsula, about lat. $22^{\circ} 52'$; but usually the town of San Lucas nearby is meant, and not infrequently, in general ornithological literature, more or less of the whole southern end of the peninsula is meant. Nelson, 1921, pl. 35; Brewster, 1902, map; U. S. Charts Nos. 1006, 621, 1666.
- Cardón Grande: in interior at about lat. $27^{\circ} 45'$. Bryant, 1889*b*, map; Brewster, 1902, map.
- Carmen Island: in the Gulf, lat. 26° ; Nelson, 1921, p. 92, pl. 35; Townsend, 1916, p. 424; U. S. Charts Nos. 1006, 621, 850.
- Carriso [or Carrizo] Valley: on Pacific drainage at about lat. $32^{\circ} 29'$, a few miles east of Tijuana. Nelson, 1921, pl. 35.
- Casa Pintada: a Belding locality in the Sierra de La Laguna, in the Cape district. Not shown on any map I have seen. About 20 miles southeast of Triunfo (*vide* C. C. Lamb).
- Cedros Island [often termed Cerros Island]: Pacific side, lat. $28^{\circ} 10'$. Nelson, 1921, p. 86, pl. 35; Townsend, 1916, p. 411; U. S. Charts Nos. 1006, 1310.
- Cerralvo [or Ceralvo, or Ceralbo] Island: in the Gulf, lat. $24^{\circ} 15'$. Nelson, 1921, p. 91, pl. 35; U. S. Charts Nos. 1006, 621.
- Cerro Prieto: see Black Mountain.
- Cerros Island: see Cedros Island.
- Cocopah Major Camp: see El Major.
- Cocopah [or Cocopa] Mountains [or Sierra de los Cocupas, or Sierra Cocopah]: range forming western boundary of main Colorado delta, extending north from a little below lat. 32° nearly to the United States boundary. Nelson, 1921, p. 68, pl. 35; Murphy, 1917, pl. 1; U. S. Geol. Surv. "Salton Sink" map. A section of this range is sometimes called Cocopan Major Mountains.
- Colnett: site of a former settlement on, or just inland from, Colnett Bay, about lat. $30^{\circ} 58'$. Nelson, 1921, pl. 35.
- Colnett Bay: Pacific side, lat. $30^{\circ} 57'$. Brewster, 1902, map; U. S. Charts Nos. 1006, 1149.
- Colony [Colonia Lerdo]: on Sonora side of Colorado River, at about lat. $32^{\circ} 7'$. Nelson, 1921, pl. 35. The neighborhood across the old channel from this place has been cited.
- Comondú: village and mission site on Pacific slope of the peninsula at lat. $26^{\circ} 5'$. Nelson, 1921, p. 38, pl. 35; U. S. Chart No. 1493.
- Concepción: a spring and ranch at about 6000 feet altitude on western flank of Sierra San Pedro Mártir; near Socorro, lat. $31^{\circ} 7'$. Nelson, 1921, pl. 35; Am. Geog. Soc. "Norte" map.
- Concepción Bay: Gulf side, lat. $26^{\circ} 40'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 620, 849.
- Consag Rock: in the head of the Gulf, off San Felipe, lat. $31^{\circ} 7'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 619.
- Coronados Islands: on the Gulf side, lat. $26^{\circ} 7'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 620, 850. Not to be confused with Los Coronados Islands which are on the Pacific side.
- Coronados Islands: see Los Coronados Islands.
- Danzante Island: on the Gulf side, lat. $25^{\circ} 47'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 621, 850.
- Descanso Bay: Pacific side, lat. $32^{\circ} 14'$. U. S. Chart No. 1149.
- Don Lorenzo: in Colorado delta, some fifty miles southeast of Mexicali (Bancroft, 1922, p. 98). Not shown on any map now available.

- El Cajón Cañon: on east side of Sierra San Pedro Mártir, opening out onto desert wash-fan at about 2300 feet altitude; latitude a little south of 31°.
- El Cajoncito: in Cape district, near west coast and a little north of lat. 23°. Goldman, 1916, map.
- El Major: camping place on western edge of Colorado delta adjacent to Hardy River and at base of Cocopah Mountains, about lat. 32° 5'. Also called El Mayor, Cocopah Major Camp, Mount Major, and simply Mayor.
- El Oro: in Cape district, some 30 miles northeast of Todos Santos; about lat. 23° 45' (C. C. Lamb, MS).
- El Piñón: see Piñon.
- El Potrero: interior locality, 600 feet altitude, near lat. 26° 40'. Nelson, 1921, p. 36, pl. 35; Am. Geog. Soc. "Sur" map.
- El Rancho Viejo: in interior at about lat. 28° 30'. Bryant, 1889*b*, map; Brewster, 1902, map.
- El Rayo: ranch on western flank of Sierra Juárez, altitude 4700 feet, a little south of lat. 32°, 7 miles west of Laguna Hanson. Nelson, 1921, pp. 15, 16, pl. 35; Mexican map Baja California No. 3.
- El Rosario [or simply Rosario]: old mission site and village near the Pacific sea-coast, lat. 30° 3'. Nelson, 1921, p. 24, pl. 35; U. S. Chart No. 1193.
- El Sauz [a Sierra]: in Sierra de La Laguna, Cape district, about lat. 23° 27'; a few miles northwest of Miraflores. Thayer, 1909*b*, p. 142; Goldman, 1916, frontispiece; Nelson, 1921, p. 46.
- El Valle: interior point on western slope of Cape district at 1500 feet altitude, about lat. 23° 47'; a few miles south of Triunfo (C. C. Lamb, MS; Nelson, 1921, p. 47).
- El Valle de La Trinidad [or Trinidad Valley]: the valley leading westward from the pass which separates the Sierra Juárez from the Sierra San Pedro Mártir, about lat. 31° 20'; altitude 2500 feet. Nelson, 1921, pp. 16, 76, pl. 35.
- Ensenada: city on Pacific coast, lat. 31° 52'. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1149, 1046.
- Ensenada Bay: see Todos Santos Bay.
- Esperanza Cañon: east side of Sierra San Pedro Mártir, about lat. 31° 10'. Nelson, 1921, p. 17, pl. 35.
- Espíritu Santo Island: in the Gulf, lat. 24° 30'. Nelson, 1921, p. 91, pl. 35; Brewster, 1902, map; U. S. Charts Nos. 1006, 621.
- Eureka: on eastern side of Cape district, about lat. 23° 35' and "seven miles south of Buena Vista" (Thayer, 1909*b*, p. 142).
- Gardner's [or Gardiner's] Laguna [or Lagoon]: an old camping place on the Salton River about 6 miles south of the United States boundary (see Mearns, 1907, p. 130, pl. I); now almost within the suburbs of Mexicali.
- Gato Creek: on Pacific drainage, I judge a little north of lat. 32°. An Anthony locality not shown on any map available to me.
- Gerónimo Island: see San Gerónimo Island.
- Gore Island: at head of the Gulf, in mouth of Colorado River, lat. 31° 43'. U. S. Geol. Surv. "Salton Sink" map; U. S. Charts Nos. 619, 800.
- Granite Island: in the Gulf at north end of Ángel de La Guardia Island, lat. 29° 34'. Slevin, 1923, map; U. S. Chart No. 638.
- Guadalupe: old mission site close to lat. 32°, and about 18 miles north of Ensenada. Nelson, 1921, pl. 35; Am. Geog. Soc. "Norte" map.
- Guadalupe Island [sometimes spelled Guadeloupe]: Pacific Ocean, lat. 29°, long. 118° 15'. Townsend, 1916, p. 407, and 1923, map; Bryant, 1887*a*, p. 269; Nelson, 1921, p. 93; Hanna, 1925; U. S. Charts Nos. 1006, 1681.
- Guadalupe Valley [Arroyo de Guadalupe]: on western drainage, near lat. 31° 25', a few miles northwest of San Vicente. Am. Geog. Soc. "Norte" map.

- Guadalupe Valley [or Cañón]: on western drainage a little above lat. 32°, nearly due north of Ensenada. Nelson, 1921, pl. 35; Am. Geog. Soc. "Norte" map.
- Guajademe: old ranch situated interiorly on western drainage at about lat. 26° 35'. Nelson, 1921, p. 36; Mexican map Baja California No. 3.
- Hanson Laguna [or "Hansen's"]: see Laguna Hanson. Sometimes has applied to what is now El Rayo (see Nelson, 1921, p. 55).
- Hardy River [or Hardy's Colorado]: in the Colorado delta, a channel of the Colorado River between Volcano Lake and about lat. 31° 55'; sometimes merely a slough, sometimes the main river. Nelson, 1921, pl. 35; Murphy, 1917, pp. 55, 71, pl. I; U. S. Geol. Surv. "Salton Sink" map.
- Hechicera [or "Hecheira"]: in Colorado delta about 25 miles southeast of Mexicali. Am. Geog. Soc. "Norte" map.
- Hole in the Wall: on mainland seacoast about 10 miles southeast of Todos Santos Islands, about lat. 31° 40'. Willett, 1913, p. 19.
- Ildefonso Island: Gulf side, lat. 26° 38'. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 620, 849.
- Isla Partida: see Partida Island.
- Isla Raza: see Raza Island.
- Jesús María: interior place a little south of lat. 27°. Bryant, 1889*b*, map; Mexican map Baja California No. 3.
- Juncal: on lower western slope of the peninsula inland from Magdalena Bay, about lat. 24° 45'. Bryant, 1889*b*, map; Mexican map Baja California No. 3.
- La Bomba [or Bomba, or Porto La Bomba]: on lower Colorado River, lat. 31° 56'. U. S. Chart No. 619.
- La Corona: meadow on Sierra San Pedro Mártir at about 7500 feet altitude, between La Jolla and La Grulla.
- La Encantada: cattle camp and meadows on the Sierra San Pedro Mártir, altitude about 7400 feet, a few miles north of La Grulla, near lat. 31°. Nelson, 1921, p. 57, pl. 35.
- La Giganta: Peak in Sierra de La Giganta near Comondú, close to lat. 26°. Nelson, 1921, pp. 38, 61, pl. 35; Am. Geog. Soc. "Sur" map.
- La Grulla: a cattle camp, meadow, and intermittently a marsh and small lake at about 7200 feet altitude on the Sierra San Pedro Mártir, a little south of lat. 31°. Nelson, 1921, pp. 21, 57, pls. 7 and 35.
- La Grulla: a ranch and gun club about 18 miles southeast of Ensenada, near lat. 31° 38'. Nelson, 1921, pl. 35; Am. Geog. Soc. "Norte" map.
- Laguna de Santiago: in the Cape district, at or near Santiago, which see; intermittently an extensive marsh or slough (*fide* C. C. Lamb).
- Laguna Hanson: small lake and its general vicinity on the Sierra Juárez, about 6000 feet altitude, close to 32° lat.; has also been called Hansen's, Hanson Lagoon, and Hanson Laguna. Nelson, 1921, pp. 15, 55, pl. 35.
- Laguna Hanson Mountains: same as, or part of, Sierra Juárez, which see.
- Laguna Salada: salt flat, sometimes overflowed from the Colorado River, west of the Cocopah Mountains and extending south from near the United States boundary to a little below lat. 32°; also called Laguna Maquata; occupies a portion of "Pattie Basin." Nelson, 1921, p. 69, pl. 35; Murphy, 1917, p. 46, pl. I.
- La Jolla [or La Joya]: camping place on western flank of Sierra San Pedro Mártir, on lat. 31°, near head of Valladares Creek, altitude close to 6200 feet. Locally called Encinas Primeras.
- La Laguna: locality in the Sierra de La Laguna, in the Cape district, about lat. 23° 35'. Nelson, 1921, pp. 47, 64, pl. 35. The laguna or small lake, whence named, no longer exists (see Belding, 1900, p. 2).
- La Paz: town and port on Gulf coast, lat. 24° 10'. Nelson, 1921, p. 43, pl. 35; U. S. Charts Nos. 621, 2103.
- La Paz Bay: on Gulf side, lat. 24° 15'. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 621.

- La Purísima: town, mission site, and valley in interior on western slope at about lat. $26^{\circ} 11'$. Nelson, 1921, pp. 37, 77, pl. 35; Bryant, 1889*b*, map; U. S. Chart No. 1493.
- Las Ánimas Bay: Gulf side, lat. $28^{\circ} 50'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 620.
- Las Ánimas Cañón: ten miles south of Ensenada, about lat. $31^{\circ} 37'$. Huey, 1926, p. 348; Am. Geog. Soc. "Norte" map.
- Las Cabras: on Pacific drainage a little above lat. 31° , almost due west of San José. Am. Geog. Soc. "Norte" map.
- Las Cruces: locality in a cañon at 2600 feet altitude, about 20 miles east of Ensenada, about lat. $31^{\circ} 52'$. Am. Geog. Soc. "Norte" map; Mexican map Baja California No. 3.
- Las Palmas Cañón: on west side of Laguna Salada and at east base of Sierra Juárez; about 25 miles south of United States boundary west of Mexicali. A locality at about 200 feet altitude worked by C. C. Lamb; not on any map that I have seen.
- Las Palmas [or Valle de Las Palmas]: place and valley on western drainage at about lat. $32^{\circ} 20'$, some 30 miles inland from the coast. Am. Geog. Soc. "Norte" map.
- Lázaro Mountain: see San Lázaro Mountains.
- Llano de San Quintín: coastal plain on Pacific side north of San Quintín, about lat. $30^{\circ} 30'$. Nelson, 1921, p. 71, pl. 35.
- Llano de Yrais: plain on east side of Magdalena Bay, lat. $24^{\circ} 40'$. Nelson, 1921, p. 41, pls. 14, 35.
- Llanos de San Julián: see San Julio.
- Loreto: village and old mission site on Gulf coast, lat. 26° . Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 620, 850.
- Los Alijos Rocks: see Alijos Rocks.
- Los Angeles Bay: on Gulf side, lat. $28^{\circ} 55'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 620. Sometimes called simply Angeles Bay.
- Los Coronados Islands: Pacific side, lat. $32^{\circ} 25'$; a group consisting of four main islands, the three larger of which are known as North, Middle and South islands. Nelson, 1921, p. 85, pl. 35; U. S. Charts Nos. 1006, 1149. Sometimes called Coronado Islands, but not to be confused with Coronados Islands in the Gulf.
- Los Mártires: ranch on Gulf coast of Cape district, near Buena Vista, lat. $23^{\circ} 38'$. Nelson, 1921, pl. 35; U. S. Chart No. 1664.
- Los Pozos: place on western slope of northern Sierra Juárez, about lat. $32^{\circ} 20'$, altitude 4200 feet. Mexican map Baja California No. 3.
- Magdalena: port on east shore of Magdalena Island facing Magdalena Bay, lat. $24^{\circ} 38'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 621, 1664, 1636.
- Magdalena Bay: Pacific side, lat. $24^{\circ} 35'$. Nelson, 1921, pl. 35. U. S. Charts Nos. 1006, 621, 1636.
- Magdalena Island: a long fringing or barrier island along Pacific side, centering about lat. $24^{\circ} 50'$; the port of Magdalena is situated on the inside of its southern end. Nelson, 1921, p. 89, pl. 35.
- Magdalena Plain: on lower Pacific slope, from about lat. $25^{\circ} 30'$ south to about $23^{\circ} 30'$. Nelson, 1921, p. 72, pl. 35.
- Mangrove Island: on Pacific side, within Magdalena Bay, lat. $24^{\circ} 32'$. U. S. Charts Nos. 1664, 1636.
- Mayor: see El Major.
- Mejía Island: in the Gulf, at north end of Ángel de La Guardia Island, lat. $29^{\circ} 33'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 619, 638.
- Mexicali: city at United States boundary, lat. $32^{\circ} 40'$, near where crossed by New River, a distributary of the Colorado. Nelson, 1921, pl. 35; U. S. Chart No. 619.

- Miraflores: in the Cape district, east of Victoria Mountains, about lat. $23^{\circ} 24'$. Nelson, 1921, p. 45, pl. 35; Brewster, 1902, map.
- Miraflores Peak: in Sierra de La Laguna, Cape district, west of town of Miraflores, about lat. $23^{\circ} 23'$. U. S. Chart No. 621.
- Misión San Pedro Mártir: in southern part of Sierra San Pedro Mártir, near lat. $30^{\circ} 40'$, altitude about 5000 feet. Nelson, 1921, p. 57, pl. 35.
- Monserate Island: in the Gulf, lat. $25^{\circ} 40'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 621, 850.
- Montague Island: at extreme head of the Gulf, in mouth of Colorado River, lat. $31^{\circ} 45'$. Nelson, 1921, pl. 35; U. S. Geol. Surv. "Salton Sink" map; U. S. Charts Nos. 619, 800.
- Monument 258: on west coast at United States boundary. Mearns, 1907, p. 136, pl. I.
- Mount Major: see El Major.
- Mulegé [or Mulejé]: town and old mission site on Gulf coast, lat. $26^{\circ} 54'$. Nelson, 1921, p. 35, pl. 35; U. S. Charts Nos. 620, 849.
- Nachogüero Valley: at United States boundary, altitude 3429 feet, about between Jacumba and Campo [Upper California]. Mearns, 1907, pp. 22, 134, pl. I. The water from springs (locally called Aguaje del Nat) flows southward in a shallow depression in rolling mesa [C. C. Lamb, MS].
- Natividad Island: Pacific side, lat. $27^{\circ} 53'$. Nelson, 1921, p. 88, pl. 35; U. S. Charts Nos. 1006, 1310.
- Nejí: interior locality on western drainage, close to lat. $32^{\circ} 25'$. Nelson, 1921, pl. 35; Am. Geog. Soc. "Norte" map.
- New River: one of the distributaries of the Colorado River flowing north along the western margin of the Colorado delta to cross the United States boundary near Mexicali. Murphy, 1917, pl. 1; U. S. Geol. Surv. "Salton Sink" map.
- North Island: see Los Coronados Islands.
- Ojos Negros: ranch 25 miles or so east of Ensenada, about lat. $31^{\circ} 52'$, altitude 2200 feet; in San Rafael Valley. Nelson, 1921, p. 15, pl. 35.
- Partida Island [or Isla Partida]: in the Gulf, lat. $28^{\circ} 53'$. Slevin, 1923, map; U. S. Chart No. 620.
- Pattie Basin [or Valley]: lies between the Cocopah Mountains and the northern portion of the Sierra Juárez; occupied in part by the Laguna Salada, which see. Nelson, 1921, pl. 35; Murphy, 1917, p. 62, pl. I.
- Pescadero: on Pacific seacoast of Cape district, lat. $23^{\circ} 22'$. Nelson, 1921, pl. 35; U. S. Chart No. 1664.
- Pescadero Slough [or River]: in middle part of Colorado delta, emptying into Hardy River. Nelson, 1921, pl. 35; U. S. Geol. Surv. "Salton Sink" map.
- Pichilínque Bay [or Harbor]: Gulf side, lat. $24^{\circ} 15'$; on east coast of La Paz Bay. Townsend, 1923, map; U. S. Charts Nos. 1006, 621, 1664, 2193.
- Pierce's Ranch: the same as San José del Rancho (see Brewster, 1902, p. 8); in the Cape district, about 15 miles southeast of Triunfo. Brewster, 1902, map.
- Pilot Knob: a hill just across the United States boundary in southeastern Imperial County, Upper California. U. S. Geol. Surv. "Salton Sink" map. Often used as a landmark in defining positions of places in the Colorado delta to the southward.
- Piñon [or El Piñón]: on western slope of northern end of Sierra San Pedro Mártir, a little above lat. 31° , 5300 altitude. Goldman, 1916, frontispiece; Nelson, 1921, p. 20.
- Playa María Bay: Pacific side, lat. $28^{\circ} 54'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1193, 1118.
- Point Banda [or Punta Banda]: on Pacific seacoast, lat. $31^{\circ} 45'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1149, 1046.
- Point San Eugenio: on Pacific seacoast, lat. $27^{\circ} 52'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1310.
- Point Santa Antonita: see Santa Antonita Point.

- Pond Lagoon: on Pacific side, lat. $26^{\circ} 46'$; near Abreojos Point. U. S. Charts Nos. 1294, 1310, 1493.
- Port San Bartolomé: see San Bartolomé Bay.
- Port San Felipe: see San Felipe Bay.
- Porto [or Puerta] La Bomba: see La Bomba.
- Pozo [or Poso] Grande [or La Posa Grande]: near Pacific seacoast, lat. $25^{\circ} 45'$. Nelson, 1921, p. 39, pl. 35; U. S. Chart No. 1493.
- Puerto [or Port] Ballandra: on Gulf side, in east shore of La Paz Bay, lat. $24^{\circ} 19'$. U. S. Charts Nos. 1664, 2193.
- Puerto [or Port] Escondido: on Gulf coast, lat. $25^{\circ} 50'$; opposite south end of Carmen Island. Slevin, 1923, map; U. S. Charts Nos. 1006, 621, 850.
- Purísima Cañón: westward sloping, at about lat. $26^{\circ} 12'$, near La Purísima, which see. Nelson, 1921, p. 37; Bryant, 1889*b*, map; Am. Geog. Soc. "Sur" map; U. S. Chart No. 1493.
- Rancho Mesquital: on lat. $28^{\circ} 15'$ toward west coast, about 33 miles westwardly from Calmallí; at mouth of Arroyo del Toro. Mexican map Baja California No. 3.
- Rancho Ojos Negros: see Ojos Negros.
- Rancho San Francisquito: see San Francisquito.
- Rancho San Pablo: see San Pablo.
- Rayitas: a Ridgway locality, supposed to be in the Cape district, but not found by me on any map.
- Raza Island [or Isla Raza]: out in the Gulf, lat. $28^{\circ} 49'$. Slevin, 1923, map; U. S. Charts Nos. 1006, 620.
- Río San Pedro: see San Pedro.
- Rosalía Bay: see Santa Rosalía Bay.
- Rosario: see El Rosario.
- Rosario Bay: on Pacific side, lat. $29^{\circ} 56'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1085, 1193.
- Rosarito [Valley]: near west coast, about lat. $28^{\circ} 35'$. Nelson, 1921, p. 30, pl. 35; Am. Geog. Soc. "Norte" map.
- Rosarito Beach: on Pacific seacoast about 18 miles south of United States boundary (Huey, 1926, pp. 348, 351).
- Salsipuedes Island: in the Gulf, lat. $28^{\circ} 44'$. Slevin, 1923, map; U. S. Chart No. 620.
- Salton River: one of the distributaries of the Colorado River which at flood time flows north across the United States boundary near Mexicali; also called Alamo River. Mearns, 1907, p. 130, pl. I; Am. Geog. Soc. "Norte" map.
- Salt Slough: see Laguna Salada.
- San Agustín [or San Agustín]: well and ranch toward eastern side of peninsula on lat. 30° . Nelson, 1921, p. 25, pl. 35; Am. Geog. Soc. "Norte" map.
- San Andrés [or San Andrés or San Andreas]: one-time ranch, spring and slough of brackish water near Pacific coast, lat. $28^{\circ} 44'$. Nelson, 1921, p. 29, pl. 35; U. S. Chart No. 1193.
- San Antonio del Mar: ranch near Pacific seacoast, lat. $31^{\circ} 7'$. Nelson, 1921, pl. 35.
- San Antonio Ranch: on tributary (San Antonio Creek) of the Santo Domingo River, 2100 feet altitude, west base of Sierra San Pedro Mártir, near lat. $30^{\circ} 50'$. Nelson, 1921, p. 22, pl. 35.
- San Bartolomé Bay [or Port San Bartolomé]: Pacific side, lat. $27^{\circ} 40'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1310.
- San Benito [or San Benito Cañon]: a short distance inland from the Pacific seacoast at about lat. $26^{\circ} 35'$. Bryant, 1889*b*, map; Am. Geog. Soc. "Sur" map.
- San Benito Islands: Pacific side, lat. $28^{\circ} 18'$. Nelson, 1921, p. 88, pl. 35; Townsend, 1916, p. 409; U. S. Charts Nos. 1006, 1310, 1193, 1194. The group consists of three islands, West, Middle and East, though not often in ascriptions are these separately designated.

- San Bernardo Mountain** [Cerro San Bernardo]: in the Sierra de La Laguna, Cape district, lat. $23^{\circ} 26'$. Am. Geog. Soc. "Sur" map. Also a ranch in the vicinity (Nelson, 1921, p. 46).
- San Borja** [or San Borgia, or San Borjas, or San Borgas]: in interior near lat. $28^{\circ} 45'$. Nelson, 1921, pl. 35; Bryant, 1889*b*, map.
- San Bruno**: on Gulf coast at lat. $27^{\circ} 9'$. Nelson, 1921, p. 35, pl. 35; Am. Geog. Soc. "Sur" map.
- San Carlos** [Landing or Anchorage]: Pacific seacoast, lat. $29^{\circ} 37'$. Nelson, 1921, pl. 35; U. S. Chart No. 1193.
- San Carlos Mesa** [Mesa de San Carlos]: near Pacific seacoast, about lat. $29^{\circ} 45'$, south of San Fernando. Nelson, 1921, pl. 35.
- San Carlos Mission**: close to Pacific seacoast, near lat. $29^{\circ} 37'$. Nelson, 1921, pl. 35.
- San Cristóbal Bay**: Pacific side, lat. $27^{\circ} 23'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1310.
- San Estéban**: interior locality near lat. $27^{\circ} 30'$. Bryant, 1889*b*, map; Nelson, 1921, pl. 35.
- San Eugenio Point**: see Point San Eugenio.
- San Felipe**: settlement on Gulf coast near Point San Felipe, lat. $31^{\circ} 2'$. Nelson, 1921, pl. 35; U. S. Chart No. 619; Huey, 1927*d*, p. 13, pls. 2, 3.
- San Felipe Bay**: Gulf side, lat. 31° . Nelson, 1921, p. 18, pl. 35; U. S. Charts Nos. 1006, 619.
- San Fernando** [Mission]: in interior on western slope, lat. 30° . Nelson, 1921, p. 24, pl. 35.
- San Francisco Island**: in the Gulf off south end of San José Island, lat. $24^{\circ} 50'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 621.
- San Francisco Mountain** [or Mountains]: in Cape district, and part of Victoria Mountain mass; probably same as, or near, Cerro San Francisquito of Am. Geog. Soc. "Sur" map; see also Nelson, 1921, p. 64.
- San Francisquito**: a "ranch" in the Sierra de La Laguna a few miles northwest of Miraflores, in the Cape district (Bryant, 1891, p. 198). Probably near Cerro San Francisquito of Am. Geog. Soc. "Sur" map.
- San Francisquito Bay**: on Gulf coast, lat. $28^{\circ} 26'$. Townsend, 1923, map; U. S. Charts Nos. 1006, 620, 638.
- San Gerónimo Island**: Pacific side, lat. $29^{\circ} 47'$. Nelson, 1921, p. 86, pl. 35; U. S. Charts Nos. 1006, 1193, 1085.
- San Gertrude Mountains**: see Sierra Santa Gertrudis.
- San Gregorio**: ranch and landing on Pacific seacoast, near lat. 26° . Bryant, 1889*b*, map; U. S. Chart No. 1493.
- San Ignacio**: old mission settlement on the interior western slope, lat. $27^{\circ} 17'$. Nelson, 1921, p. 33, pl. 35.
- San Ignacio Lagoon**: on Pacific coast, entrance at about lat. $26^{\circ} 45'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1493, 1494.
- San Isidro**: see San Ysidro.
- San Javier** [or San Jabier, or San Xavier]: interior locality at about lat. $28^{\circ} 30'$. Nelson, 1921, pl. 35.
- San Jorge**: near Pacific seacoast, lat. $25^{\circ} 44'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 621, 1493.
- San José**: a place in the Cape district close to La Paz. Thayer, 1909*a*, p. 10. [I have not found this on any map.]
- San José**: ranch near, or on, west base of Sierra San Pedro Mártir, about lat. 31° , altitude 2500 feet. Nelson, 1921, pl. 35.
- San José del Cabo** [simply San José in some publications]: in the Cape district, southeastern seacoast, lat. $23^{\circ} 3'$; on bay of same name. Brewster, 1902, p. 11, map; Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1667.

- San José del Rancho: about 15 miles southeast of Triunfo in the Cape district, lat. 23° 50'. Brewster, 1902, p. 8, map.
- San José Island [often termed San Josef Island]: in the Gulf, lat. 25°. Nelson, 1921, p. 92, pl. 35; Townsend, 1916, map; U. S. Charts Nos. 1006, 621.
- San Josef Island: see San José Island.
- San Juan: a ranch in the Sierra de La Giganta, about 26° lat., "half a day's ride from Loreto" (Bryant, 1889*b*, p. 239); northeast from Comondú. Mexican map Baja California No. 3.
- San Juan de Dios: see Cañón San Juan de Dios.
- San Juanico Bay: Pacific side, lat. 26° 13'. U. S. Chart No. 1493.
- San Julio: an interior point near Comondú, lat. 26°. Also referred to as "Llanos de San Julián" or "plains of San Julio" (Bryant, 1889*b*, pp. 239, 301).
- San Lázaro [Cape]: see Cape San Lázaro.
- San [or "St."] Lázaro Mountains [Sierra de San Lázaro]: in the Cape district, an outlying southern part of the Victoria Mountains near lat. 23° 12'. Brewster, 1902, map; U. S. Chart No. 621; Nelson, 1921, p. 63.
- San Lucas: town at southernmost tip of the peninsula, about lat. 22° 53'; often called Cape St. Lucas or Cabo San Lucas; see Cape San Lucas. Nelson, 1921, pl. 35; Brewster, 1902, map; U. S. Charts Nos. 621, 1666.
- San Lucas [or San Lucas Cove]: on Gulf coast, lat. 27° 14'. Nelson, 1921, pl. 35; U. S. Charts Nos. 620, 849.
- San Lucas Bay: at southern end of Cape district, close to Cape San Lucas, which see. U. S. Chart No. 1006.
- San Luís Island: in the Gulf, lat. 29° 58'; the largest of the San Luís group of islands. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 619.
- San Luís Islands: a group adjacent to the Gulf coast, lat. 30°. Nelson, 1921, pl. 35; U. S. Chart No. 619. Sometimes called San Luís Archipelago (Bancroft, 1926, p. 211).
- San Marcos Island: Gulf side, lat. 27° 13'. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 620, 849.
- San Martín Island: Pacific side, lat. 30° 29'. Nelson, 1921, pp. 23, 86, pl. 35; U. S. Charts Nos. 1006, 1149.
- San Nicolás: in Cape district a little north of lat. 23° and not far from San José del Cabo. Brewster, 1902, map.
- San Pablo: old mission site in interior close to lat. 27° 40'. Nelson, 1921, p. 32, pl. 35; Mexican map Baja California No. 3.
- San Pablo [or Rancho San Pablo]: on western drainage interiorly, near lat. 31° 30'. Am. Geog. Soc. "Norte" map; Mexican map Baja California No. 3.
- San Pablo Peak: near lat. 31° 30', south of Alamo, altitude about 4200 feet. Am. Geog. Soc. "Norte" map.
- San Pedro: interior locality not far northeast of Comondú, lat. 26° 5'. Bryant, 1889*b*, p. 239; Mexican map Baja California No. 3.
- San Pedro [Ranch]: on Pacific seacoast of Cape district, lat. 23° 24'; six miles south of Todos Santos. Brewster, 1902, map; U. S. Chart No. 1664.
- San Pedro [Río]: in Cape district some 18 miles south of La Paz. Nelson, 1921, p. 43, pl. 35; Mexican map Baja California No. 3.
- San Pedro Mártir Island: in the Gulf, lat. 28° 22'. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 620. But not properly a Lower Californian locality, though very often cited as such.
- San Pedro Mártir Mission: see Misión San Pedro Mártir.
- San Pedro Mártir Mountains: see Sierra San Pedro Mártir.
- San Pedro Mountain: see Sierra San Pedro Mártir.
- San Quintín [often spelled San Quentin]: settlement and port on Pacific coast, lat. 30° 29'. Nelson, 1921, p. 23, pl. 35; U. S. Charts Nos. 1006, 1149.
- San Quintín [or San Quentin] Bay: Pacific side, lat. 30°, 23'. Nelson, 1921, pl. 35; U. S. Chart No. 1149.

San Quintín Plain: see Llano de San Quintín.

San Rafael: 25 miles east of Ensenada (Bryant, 1889*b*, p. 246); in San Rafael Valley, which see.

San Rafael Valley [or Valle de San Rafael]: about lat. 31° 55', 25 miles east of Ensenada (see Bryant, 1889*b*, p. 246). Nelson, 1921, p. 75, pl. 35.

San Raimundo: place near Pacific coast, about lat. 26° 20' and some 12 miles northwest of San Juanico. Bryant, 1889*b*, map; Brewster, 1902, map.

San Ramón: on Pacific coast, at mouth of Santo Domingo River, lat. 30° 43'. Brewster, 1902, map; U. S. Chart No. 1149.

San Roque Bay: Pacific side, lat. 27° 8'. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1310, 1268.

San Roque Island: Pacific side, in San Roque Bay, lat. 27° 9'. Brewster, 1902, map; U. S. Charts Nos. 1310, 1268; Nelson, 1921, p. 89.

San Sebastián: an interior place a little south of lat. 28° 30'. Bryant, 1889*b*, map; Brewster, 1902, map.

San Simón River [also ranch]: enters Pacific Ocean at San Quintín Bay, lat. 30° 24', just south of San Quintín. Nelson, 1921, p. 23; Am. Geog. Soc. "Norte" map; U. S. Chart No. 1193.

Sangre de Cristo: near western base of Sierra Juárez, near lat. 31° 50'. Nelson, 1921, pl. 35.

Santa Anita: in Cape district eight miles north of San José del Cabo, about lat. 23° 10'. Nelson, 1921, p. 45; Am. Geog. Soc. "Sur" map; Mexican map Baja California No. 3.

Santa Antonita Point: on Gulf coast, lat. 26° 32', south side of San Nicolás Bay. Slevin, 1923, map; U. S. Chart No. 849.

Santa Catalina Island: Gulf side, lat. 25° 40'. Nelson, 1921, pl. 35. U. S. Charts Nos. 1006, 621.

Santa Catarina Landing: on Pacific seacoast near lat. 29° 30'. Nelson, 1921, pl. 35; Am. Geog. Soc. "Norte" map.

Santa Cruz: on tributary of Santo Domingo River, west side of Sierra San Pedro Mártir, near lat. 30° 55'. Nelson, 1921, pl. 35; Am. Geog. Soc. "Norte" map.

Santa Cruz Island: Gulf side, lat. 25° 17'. Nelson, 1921, pl. 35; Townsend, 1923, map; U. S. Charts Nos. 1006, 621.

Santa Eulalia [or Ulalia]: in southern end of Sierra San Pedro Mártir, about 6000 feet altitude, near lat. 30° 36'. Nelson, 1921, p. 57; Am. Geog. Soc. "Norte" map.

Santa Inez Islands: Gulf side, lat. 27° 2'. Slevin, 1923, map; U. S. Charts Nos. 620, 849.

Santa Margarita Island [sometimes spelled Santa Marguerita]: Pacific side, lat. 24° 25'. Nelson, 1921, p. 90, pl. 35; U. S. Charts Nos. 1006, 621.

Santa María: ranch near Pacific seacoast at about lat. 30° 24'; five miles or so south of San Quintín. Nelson, 1921, p. 23, pl. 35; U. S. Chart No. 1149.

Santa María Bay: Pacific side, lat. 24° 45'. Nelson, 1921, pl. 35; Townsend, 1923, map; U. S. Charts Nos. 621, 1493.

Santana: interior locality near lat. 28° 40'. Bryant, 1889*b*, map; Thayer and Bangs, 1907*c*, p. 136.

Santa Rosa Cañon: on east side of Sierra San Pedro Mártir, near lat. 30° 40'. Nelson, 1921, p. 22, pl. 35.

Santa Rosa Flats [or Park, or Valley]: locality in southern part of Sierra San Pedro Mártir, about lat. 30° 40', altitude near 6000 feet; not far east of Misión San Pedro Mártir. Nelson, 1921, pp. 22, 57, pl. 35; Am. Geog. Soc. "Norte" map.

Santa Rosalía: port and town on Gulf coast, lat. 27° 20'. Nelson, 1921, p. 34, pl. 35; U. S. Charts Nos. 1006, 620.

Santa Rosalía Bay: Pacific side, lat. 28° 38'. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1193, 1100.

Santa Rosarita: a Ridgway locality, possibly the same as Rosarito, which see.

- San Telmo:** village close to lat. 31° , about 600 feet altitude, and about 20 miles east of Cape Colnett. Nelson, 1921, pl. 35; U. S. Chart No. 1149.
- Santiago:** in eastern interior of Cape district, about lat. $23^{\circ} 28'$. Nelson, 1921, pl. 35; Brewster, 1902, map.
- Santiago Peak:** in east-central part of Cape district, west of town of Santiago, about lat. $23^{\circ} 28'$. Belding, 1883b, p. 546.
- Santo Domingo:** mission and ranch near Pacific coast at lat. $30^{\circ} 44'$; on Santo Domingo River. Nelson, 1921, pl. 35; U. S. Chart No. 1149.
- Santo Domingo [Landing]:** on Pacific seacoast, near lat. $28^{\circ} 15'$. Bryant, 1889b, map; Nelson, 1921, p. 30, pl. 35; Am. Geog. Soc. "Norte" map.
- Santo Domingo [Rancho]:** near Pacific seacoast about lat. $25^{\circ} 30'$. Nelson, 1921, p. 39, pl. 35; Mexican map Baja California No. 3; U. S. Chart No. 621.
- Santo [or San] Domingo Point:** Pacific coast, lat. $26^{\circ} 19'$. U. S. Charts Nos. 1006, 1493.
- Santo Domingo River:** the largest stream, and permanent in its upper course, flowing west from the Sierra San Pedro Mártir, about lat. $30^{\circ} 45'$. Nelson, 1921, pl. 35.
- Santo Tomás:** valley and cattle camp in southern part of Sierra San Pedro Mártir, altitude about 6000 feet, near lat. $30^{\circ} 40'$. Nelson, 1921, p. 22.
- Santo Tomás:** village and mission about 25 miles southeast of Ensenada, about lat. $31^{\circ} 35'$. Nelson, 1921, pl. 35; U. S. Chart No. 1149.
- Santo Tomás Anchorage [or Bay]:** Pacific side, lat. $31^{\circ} 33'$. U. S. Charts Nos. 1149, 1044.
- San Vicente:** old mission site on Pacific drainage at about lat. $31^{\circ} 20'$. Nelson, 1921, pl. 35; Mexican map Baja California No. 3.
- San Ysidro [or Isidro]:** ranch near Pacific seacoast at about lat. $31^{\circ} 17'$. Bryant, 1889b, p. 246; Mexican map Baja California No. 3; U. S. Chart No. 1149.
- San Ysidro [or Isidro] Ranch:** on Pacific drainage within two miles of United States boundary and 19 miles east from Pacific seacoast. Mearns, 1907, p. 136, pl. I.
- Sausal del Comanche [=Sausal de Camacho]:** an Anthony locality on Pacific drainage, a little south of lat. 32° ; a few miles northwest of Ensenada. Not found by me on any published map, only on a blueprint (Goldbaum's of date 1919).
- Scammon [or Scammon's] Lagoon:** on Pacific coast, entrance at lat. $27^{\circ} 54'$. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1310. Locally called Laguna Ojo de Liebre: Mexican map Baja California No. 3.
- Seven Wells:** an old camp site on Salton River, 5 miles south of the United States boundary and 24 miles west of the Colorado River. Mearns, 1907, p. 129, pl. I; U. S. Geol. Surv. "Salton Sink" map. The present channel (Alamo River) is some three miles to the south (*vide* C. C. Lamb).
- Sierra de La Giganta:** the axial mountain range of the peninsula along about latitudes 25° and 26° . Nelson, 1921, pl. 35.
- Sierra de La Laguna:** the northern portion of the Victoria Mountains, in the Cape district. Nelson, 1921, p. 64, pl. 35; Brewster, 1902, p. 9; Am. Geog. Soc. "Sur" map.
- Sierra de La Victoria:** see Victoria Mountains.
- Sierra Juárez:** the median mountain mass in the extreme north end of the peninsula, extending from about lat. $32^{\circ} 30'$ south to lat. $31^{\circ} 20'$. Nelson, 1921, p. 55, pl. 35. Have also been called Laguna Hanson Mountains.
- Sierra Santa Gertrudis [or San Gertrude]:** a southern section of the Victoria Mountains, in the Cape district, not far from San José del Cabo; a Xantus locality I have not found on any modern map.
- Sierra San Pedro Mártir:** the main, and highest, mountain mass in the northern section of the peninsula, lying between about latitudes $30^{\circ} 25'$ and $31^{\circ} 20'$. Nelson, 1921, pp. 54 ff., pl. 35; Anthony, 1893, p. 229.
- Socorro:** mining locality on west base of Sierra San Pedro Mártir, about lat. $31^{\circ} 5'$. Nelson, 1921, pl. 35.

- Soledad [Stock Ranch, also Landing]: on or near Pacific seacoast, about lat. 25° 15'. Bryant, 1889b, map; Nelson, 1921, p. 39, pl. 35; Mexican map Baja California No. 3; U. S. Chart No. 1493. Also called Matancita.
- South Island: see Los Coronados Islands.
- Tecate [or Tecate Valley]: on Pacific drainage, close to United States boundary, and some 25 miles due east of Tijuana. Nelson, 1921, pl. 35.
- Tia Juana Valley: valley of the Tia Juana River, flowing westward to the Pacific closely along the United States boundary, about lat. 32° 32'. U. S. Chart No. 1149.
- Tijuana [spelled also Tia Juana]: town at United States boundary, near Pacific seacoast, lat. 32° 32'. Nelson, 1921, pl. 35.
- Todos Santos: early designation for Ensenada, which see. The entire name is Ensenada de Todos Santos.
- Todos Santos: town on Pacific Coast of Cape district, lat. 23° 27'. Nelson, 1921, p. 43, pl. 35; U. S. Charts Nos. 1006, 621.
- Todos Santos Bay: Pacific side, lat. 31° 48'. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1149, 1046.
- Todos Santos Islands: Pacific side, off Ensenada, lat. 31° 48'; group consists of two main islands and numerous rocks. Nelson, 1921, p. 85, pl. 35; U. S. Charts Nos. 1149, 1046.
- Tres Pozos: water-holes on the Colorado Desert south of Laguna Salada, about lat. 31° 53'. Murphy, 1917, p. 60, pl. I.
- Trinidad Peak [or Cerro Trinidad]: near west coast opposite Santa Rosalía Bay, near lat. 28° 25'. Am. Geog. Soc. "Norte" map.
- Trinidad Valley: see El Valle de La Trinidad.
- Triunfo: mining center in the Cape district, about lat. 23° 50' and some 30 miles southeast of La Paz. Brewster, 1902, p. 7 and map; Nelson, 1921, pl. 35.
- Turtle Bay: Pacific side, lat. 27° 39'; a portion of San Bartolomé Bay. Nelson, 1921, pl. 35; Townsend, 1916, p. 413; U. S. Charts Nos. 1310, 1204.
- Ubi: see Yubay.
- Valladares: an old mining camp at 2700 feet altitude on a tributary of the Santo Domingo River, west base of Sierra San Pedro Mártir, about lat. 30° 52'. Nelson, 1921, pl. 35.
- Vallecito Creek: on Pacific drainage north of lat. 32°; probably near Vallecitos, which see.
- Vallecitos: cattle camp at about 8000 feet altitude on Sierra San Pedro Mártir, near lat. 31°. Nelson, 1921, pp. 20, 57, pls. 6, 35.
- Vallecitos: interior place on western drainage at about lat. 32° 12'. Nelson, 1921, pl. 35.
- Valle de Las Palmas: see Las Palmas.
- Valle de San Rafael: see San Rafael Valley.
- Valle Trinidad: see El Valle de La Trinidad.
- Victoria Mountains [Cerro Victoria]: a small section of the Sierra de La Giganta at about 26° lat. Nelson, 1921, pl. 35; Brewster, 1902, p. 5; Am. Geog. Soc. "Sur" map.
- Victoria Mountains [or Sierra de La Victoria]: the main mountain mass in the Cape district extending north and south from near Triunfo nearly to Cape San Lucas. Nelson, 1921, p. 62, pl. 35; Am. Geog. Soc. "Sur" map.
- Vizcaino Bay [or Sebastián Vizcaino Bay]: on Pacific side, lat. 28°. Nelson, 1921, pl. 35; U. S. Charts Nos. 1006, 1310.
- Volcano Lake [or Laguna de los Volcanes]: in the Colorado delta, lat. 32° 25'; existence intermittent, subject to overflow or to diking. Murphy, 1917, pl. I; Nelson, 1921, pl. 35; U. S. Geol. Surv. "Salton Sink" map.
- West Benito Island: see San Benito Islands.
- Yubay [or Youbai, or Yubai, or Ubi]: an interior locality on about lat. 29° 20'. Brewster, 1902, map; Nelson, 1921, p. 28, pl. 35.

SYSTEMATIC CHECK-LIST OF THE SPECIES

NOTE.—The sequence here employed is essentially different from that obtaining in the "General Accounts" to follow. The sequence in the latter connection is used as a matter of convenience, to concord with the mass of preceding literature, and is that of the first three editions of the American Ornithologists' Union Check-list of North American Birds. The order of names in the present "Check-list" is consistent with the classification, as closely as I can now judge, to be adopted in the new, fourth edition of the American Ornithologists' Union Check-list. And this classification represents the down-to-date conclusions of our foremost systematic students (Ridgway, Wetmore, Oberholser, W. DeW. Miller, Richmond, Hellmayr, and others) as to phylogenetic relationships.

The following list contains the names of all the species and subspecies of birds so far authentically credited to Lower California. There are 475 of all forms (differentiates), these representing 354 full species belonging to 230 genera, 57 families, and 18 orders.

Class **AVES** BirdsSubclass *NEORNITHES* Latter-day Birds

Order GAVIIFORMES Loon-like Birds

Family **GAVIIDAE** Loons

Gavia immer (Brünnich). Common Loon.

Gavia pacifica (Lawrence). Pacific Loon.

Gavia stellata (Pontoppidan). Red-throated Loon.

Order COLYMBIFORMES Grebe-like Birds

Family **COLYMBIDAE** Grebes

Colymbus nigricollis (Brehm). Eared Grebe.

Colymbus nigricollis californicus (Heermann). American Eared Grebe.

Colymbus dominicus Linnaeus. Santo Domingo Grebe.

Colymbus dominicus brachypterus Chapman. Short-winged Santo Domingo Grebe.

Aechmophorus occidentalis (Lawrence). Western Grebe.

Podilymbus podiceps (Linnaeus). Pied-billed Grebe.

Podilymbus podiceps podiceps (Linnaeus). Northern Pied-billed Grebe.

Order PROCELLARIIFORMES Petrel-like Birds

Family **DIOMEDEIDAE** Albatrosses

Diomedea nigripes Audubon. Black-footed Albatross.

Diomedea albatrus Pallas. Short-tailed Albatross.

Diomedea immutabilis Rothschild. Laysan Albatross.

Family **PROCELLARIIDAE** Shearwaters and Fulmars

Puffinus griseus (Gmelin). Dark-bodied Shearwater.

Puffinus creatopus Coues. Pink-footed Shearwater.

Puffinus auricularis C. H. Townsend. Townsend Shearwater.

Puffinus opisthomelas Coues. Black-vented Shearwater.

Puffinus cuneatus Salvin. Wedge-tailed Shearwater.

Fulmarus glacialis (Linnaeus). Fulmar.

Fulmarus glacialis rodgersi Cassin. Pacific Fulmar.

Family **HYDROBATIDAE** Petrels

Oceanodroma leucorhoa (Vieillot). Leach Petrel.

Oceanodroma leucorhoa kaedingi Anthony. Kaeding Leach Petrel.

Oceanodroma socorroensis C. H. Townsend. Socorro Petrel.

Oceanodroma macrodactyla W. E. Bryant. Guadalupe Petrel.

Oceanodroma homochroa (Coues). Ashy Petrel.

Oceanodroma melania (Bonaparte). Black Petrel.

Halocyptena microsoma Coues. Least Petrel.

Order PELECANIFORMES Pelican-like Birds

Family **PHAETHONTIDAE** Tropic-birds

Phaethon aethereus Linnaeus. Red-billed Tropic-bird.

Phaethon rubricaudus Boddaert. Red-tailed Tropic-bird.

Phaethon rubricaudus rothschildi Mathews. Laysan Red-tailed Tropic-bird.

Family **PELECANIDAE** Pelicans

Pelecanus erythrorhynchos Gmelin. American White Pelican.

Pelecanus occidentalis Linnaeus. Brown Pelican.

Pelecanus occidentalis californicus Ridgway. California Brown Pelican.

Family **SULIDAE** Boobies and Gannets

Sula dactylatra Lesson. Blue-faced Booby.

Sula dactylatra californica Rothschild. Pacific Blue-faced Booby.

Sula nebouxii Milne-Edwards. Blue-footed Booby.

Sula brewsteri Goss. Brewster Booby.

Family **PHALACROCORACIDAE** Cormorants

Phalacrocorax auritus (Lesson). Double-crested Cormorant.

Phalacrocorax auritus albociliatus Ridgway. Farallon Double-crested Cormorant.

Phalacrocorax penicillatus (Brandt). Brandt Cormorant.

Phalacrocorax pelagicus Pallas. Pelagic Cormorant.

Phalacrocorax pelagicus resplendens Audubon. Baird Pelagic Cormorant.

Family **FREGATIDAE** Man-'o-war-birds

Fregata magnificens Mathews. Galápagos Man-'o-war-bird.

Fregata minor Gmelin. Pacific Man-o'-war-bird.

Fregata minor palmerstoni (Gmelin). North Pacific Man-o'-war-bird.

Order **CICONIIFORMES** Stork-like BirdsFamily **ARDEIDAE** Herons and Bitterns

Ardea herodias Linnaeus. Great Blue Heron.

Ardea herodias hyperonca Oberholser. California Great Blue Heron.

Ardea herodias treganzai Court. Pallid Great Blue Heron.

Ardea herodias sancti-lucae Thayer and Bangs. Espíritu Santo Great Blue Heron.

Casmerodius albus (Linnaeus). White Egret.

Casmerodius albus egretta (Gmelin). American White Egret.

Egretta thula (Molina). Snowy Heron.

Egretta thula thula (Molina). Common Snowy Heron.

Egretta thula brewsteri Thayer and Bangs. Brewster Snowy Heron.

Dichromanassa rufescens (Gmelin). Reddish Egret.

Dichromanassa rufescens dickeyi van Rossem. Lower California Reddish Egret.

Hydranassa tricolor (Müller). Louisiana Heron.

Hydranassa tricolor ruficollis (Gosse). Louisiana Heron.

Florida caerulea (Linnaeus). Little Blue Heron.

Florida caerulea caerulea (Linnaeus). Northern Little Blue Heron.

Butorides virescens (Linnaeus). Green Heron.

Butorides virescens anthonyi (Mearns). Anthony Green Heron.

Butorides virescens frazari (Brewster). Frazar Green Heron.

Nycticorax nycticorax (Linnaeus). Black-crowned Night Heron.

Nycticorax nycticorax naevius (Boddaert). American Black-crowned Night Heron.

Nyctanassa violacea (Linnaeus). Yellow-crowned Night Heron.

Nyctanassa violacea bancrofti Huey. Bancroft Yellow-crowned Night Heron.

Botaurus lentiginosus (Montagu). American Bittern.

Ixobrychus exilis (Gmelin). Least Bittern.

Ixobrychus exilis hesperis Dickey and van Rossem. Western Least Bittern.

Family **CICONIIDAE** Storks and Wood Ibises

Mycteria americana Linnaeus. Wood Ibis.

Family **THRESKIORNITHIDAE** Common Ibises and Spoonbills

Plegadis guarauna (Linnaeus). White-faced Glossy Ibis.

Guara alba (Linnaeus). White Ibis.

Ajaia ajaja (Linnaeus). Roseate Spoonbill.

Order **ANSERIFORMES** Goose-like BirdsFamily **ANATIDAE** Ducks, Geese and Swans

Cygnus columbianus (Ord). Whistling Swan.

Branta nigricans (Lawrence). Black Sea Brant.

Branta canadensis (Linnaeus). Canada Goose.

Branta canadensis hutchinsii (Richardson). Hutchins' Canada Goose.

Anser albifrons (Scopoli). White-fronted Goose.

Anser albifrons albifrons (Scopoli). Common White-fronted Goose.

Chen hyperboreus (Pallas). Snow Goose.

Chen hyperboreus hyperboreus (Pallas). Lesser Snow Goose.

Dendrocygna bicolor (Vieillot). Fulvous Tree-duck.

Anas platyrhynchos Linnaeus. Mallard.

Anas platyrhynchos platyrhynchos Linnaeus. Common Mallard.

Chaulelasmus streperus (Linnaeus). Gadwall.

Mareca americana (Gmelin). Baldpate.

Dafla acuta (Linnaeus). Pintail Duck.

Dafla acuta tzitzihua (Vieillot). American Pintail Duck.

Nettion carolinense (Gmelin). Green-winged Teal.

Querquedula discors (Linnaeus). Blue-winged Teal.

Querquedula cyanoptera (Vieillot). Cinnamon Teal.

Spatula clypeata (Linnaeus). Shoveller Duck.

Nyroca americana (Eyton). Redhead Duck.

Nyroca valisineria (Wilson). Canvas-back Duck.

Nyroca marila (Linnaeus). Greater Scaup Duck.

Nyroca affinis (Eyton). Lesser Scaup Duck.

Glaucionetta clangula (Linnaeus). Golden-eye Duck.

Glaucionetta clangula americana (Bonaparte). American Golden-eye Duck.

Charitonetta albeola (Linnaeus). Buffle-head Duck.

Melanitta deglandi (Bonaparte). White-winged Scoter.

Melanitta perspicillata (Linnaeus). Surf Scoter.

Erismatura jamaicensis (Gmelin). Ruddy Duck.

Erismatura jamaicensis rubida (Wilson). Northern Ruddy Duck.

Lophodytes cucullatus (Linnaeus). Hooded Merganser.

Mergus serrator Linnaeus. Red-breasted Merganser.

Order FALCONIFORMES Hawk-like Birds

Family CATHARTIDAE American Vultures

Cathartes aura (Linnaeus). Turkey Vulture.

Cathartes aura septentrionalis Wied. Northern Turkey Vulture.

Gymnogyps californianus (Shaw). California Condor.

Family ACCIPITRIDAE Kites, Hawks and Eagles

Elanus leucurus (Vieillot). White-tailed Kite.

Elanus leucurus majusculus Bangs and Penard. North American White-tailed Kite.

Accipiter velox (Wilson). Sharp-shinned Hawk.

Accipiter cooperii (Bonaparte). Cooper Hawk.

Buteo borealis (Gmelin). Red-tailed Hawk.

Buteo borealis calurus Cassin. Western Red-tailed Hawk.

Buteo lineatus (Gmelin). Red-shouldered Hawk.

Buteo lineatus elegans Cassin. Red-bellied Red-shouldered Hawk.

Buteo abbreviatus Cabanis. Zone-tailed Hawk.

Buteo swainsoni Bonaparte. Swainson Hawk.

Buteo regalis (Gray). Ferruginous Rough-legged Hawk.

Parabuteo unicinctus (Temminck). One-banded Hawk.

Parabuteo unicinctus harrisi (Audubon). Harris One-banded Hawk.

Aquila chrysaëtos (Linnaeus). Golden Eagle.

Haliaeetus leucocephalus (Linnaeus). Bald Eagle.

Haliaeetus leucocephalus leucocephalus (Linnaeus). Southern Bald Eagle.

Circus hudsonius (Linnaeus). Marsh Hawk.

Pandion haliaëtus (Linnaeus). Osprey.

Pandion haliaëtus carolinensis (Gmelin). American Osprey.

Family FALCONIDAE Falcons and Caracaras

Polyborus cheriway (Jacquin). Caracara.

Polyborus cheriway auduboni Cassin. Audubon Caracara.

Polyborus lutosus Ridgway. Guadalupe Caracara.

Falco mexicanus Schlegel. Prairie Falcon.

Falco peregrinus Tunstall. Duck Hawk.

Falco peregrinus anatum Bonaparte. American Duck Hawk.

Falco columbarius Linnaeus. Pigeon Hawk.

Falco columbarius bendirei Swann. Western Pigeon Hawk.

Falco sparverius Linnaeus. Sparrow Hawk.

Falco sparverius phalaena (Lesson). Desert Sparrow Hawk.

Falco sparverius peninsularis Mearns. San Lucas Sparrow Hawk.

Order GALLIFORMES Fowl-like Birds

Family **PERDICIDAE** Partridges, Quails, etc.**Lophortyx californica** (Shaw). California Quail.**Lophortyx californica vallicola** (Ridgway). Valley California Quail.**Lophortyx californica plumbea** Grinnell. San Quintín California Quail.**Lophortyx californica achrustera** Peters. San Lucas California Quail.**Lophortyx gambelii** Gambel. Gambel Quail.**Lophortyx gambelii gambelii** Gambel. Western Gambel Quail.**Oreortyx picta** (Douglas). Mountain Quail.**Oreortyx picta confinis** Anthony. San Pedro Mártir Mountain Quail.

Order MEGALORNITHIFORMES Crane-like Birds

Family **MEGALORNITHIDAE** Cranes.**Megalornis canadensis** (Linnaeus). Brown Crane.**Megalornis canadensis canadensis** (Linnaeus). Little Brown Crane.Family **RALLIDAE** Rails, Coots and Gallinules**Rallus levipes** Bangs. Light-footed Clapper Rail.**Rallus beldingi** Ridgway. Belding Clapper Rail.**Rallus virginianus** Linnaeus. Virginia Rail.**Perzana carolina** (Linnaeus). Sora Rail.**Oreiscus jamaicensis** (Gmelin). Black Rail.**Oreiscus jamaicensis coturniculus** (Ridgway). California Black Rail.**Gallinula chloropus** (Linnaeus). Gallinule.**Gallinula chloropus cachinnans** Bangs. Florida Gallinule.**Fulica americana** Gmelin. American Coot.**Fulica americana americana** Gmelin. North American Coot.

Order CHARADRIIFORMES Plover-like Birds

Family **HAEMATOPODIDAE** Oyster-catchers**Haematopus palliatus** Temminck. Oyster-catcher.**Haematopus palliatus frazari** Brewster. Frazar Oyster-catcher.**Haematopus bachmani** Audubon. Black Oyster-catcher.Family **CHARADRIIDAE** Plovers, Turnstones, etc.**Charadrius nivosus** (Cassin). Snowy Plover.**Charadrius nivosus nivosus** (Cassin). Western Snowy Plover.**Charadrius semipalmatus** Bonaparte. Semipalmated Plover.

Pagolla wilsonia (Ord). Wilson Plover.

Pagolla wilsonia beldingi Ridgway. Belding Wilson Plover.

Eupoda montana (J. K. Townsend). Mountain Plover.

Oxyechus vociferus (Linnaeus). Killdeer.

Oxyechus vociferus vociferus (Linnaeus). Northern Killdeer.

Pluvialis dominicus (Müller). Golden Plover.

Pluvialis dominicus dominicus (Müller). American Golden Plover.

Squatarola squatarola (Linnaeus). Black-bellied Plover.

Squatarola squatarola squatarola (Linnaeus). Common Black-bellied Plover.

Aphriza virgata (Gmelin). Surf-bird.

Arenaria interpres (Linnaeus). Turnstone.

Arenaria interpres morinella (Linnaeus). Ruddy Turnstone.

Arenaria melanocephala (Vigors). Black Turnstone.

Family **SCOLOPACIDAE** Snipes, Sandpipers, etc.

Capella delicata (Ord). Wilson Snipe.

Numenius americanus Bechstein. Long-billed Curlew.

Phaeopus hudsonicus (Latham). Hudsonian Curlew.

Actitis macularia (Linnaeus). Spotted Sandpiper.

Tringa solitaria Wilson. Solitary Sandpiper.

Tringa solitaria solitaria Wilson. Eastern Solitary Sandpiper.

Tringa solitaria cinnamomea (Brewster). Western Solitary Sandpiper.

Heteroscelus incanus (Gmelin). Wandering Tattler.

Catoptrophorus semipalmatus (Gmelin). Willet.

Catoptrophorus semipalmatus inornatus (Brewster). Western Willet.

Totanus melanoleucus (Gmelin). Greater Yellow-legs.

Totanus flavipes (Gmelin). Lesser Yellow-legs.

Canutus canutus Linnaeus. Knot.

Canutus canutus rufus (Wilson). American Knot.

Pisobia maculata (Vieillot). Pectoral Sandpiper.

Pisobia bairdii (Coues). Baird Sandpiper.

Pisobia minutilla (Vieillot). Least Sandpiper.

Pelidna alpina (Linnaeus). Dunlin.

Pelidna alpina sakhalina (Vieillot). Red-backed Dunlin.

Limnodromus griseus (Gmelin). Dowitcher.

Limnodromus griseus scolopaceus (Say). Long-billed Dowitcher.

Ereunetes mauri Cabanis. Western Sandpiper.

Limosa fedoa (Linnaeus). Marbled Godwit.

Calidris alba (Pallas). Sanderling.

Family **RECURVIROSTRIDAE** Avocets and Stilts

Recurvirostra americana Gmelin. American Avocet.

Himantopus mexicanus (Müller). Black-necked Stilt.

Family **PHALAROPODIDAE** Phalaropes**Phalaropus fulicarius** (Linnaeus). Red Phalarope.**Steganopus tricolor** Vieillot. Wilson Phalarope.**Lobipes lobatus** (Linnaeus). Northern Phalarope.Family **STERCORARIIDAE** Jaegers and Skuas**Stercorarius parasiticus** (Linnaeus). Parasitic Jaeger.Family **LARIDAE** Gulls, Terns, etc.**Larus glaucescens** Naumann. Glaucous-winged Gull.**Larus occidentalis** Audubon. Western Gull.**Larus occidentalis wymani** Dickey and van Rossem. Southern Western Gull.**Larus occidentalis livens** Dwight. Yellow-footed Western Gull.**Larus argentatus** Pontoppidan. Herring Gull.**Larus argentatus smithsonianus** Coues. American Herring Gull.**Larus californicus** Lawrence. California Gull.**Larus delawarensis** Ord. Ring-billed Gull.**Larus philadelphia** (Ord). Bonaparte Gull.**Larus atricilla** Linnaeus. Laughing Gull.**Larus heermanni** Cassin. Heermann Gull.**Rissa tridactyla** (Linnaeus). Kittiwake.**Rissa tridactyla pollicaris** Stejneger. Pacific Kittiwake.**Xema sabini** (J. Sabine). Sabine Gull.**Gelochelidon nilotica** (Linnaeus). Gull-billed Tern.**Gelochelidon nilotica aranea** (Wilson). American Gull-billed Tern.**Sterna hirundo** Linnaeus. Common Tern.**Sterna forsteri** Nuttall. Forster Tern.**Sterna fuscata** Linnaeus. Sooty Tern.**Sterna fuscata crissalis** (Lawrence). Socorro Sooty Tern.**Sterna antillarum** (Lesson). Least Tern.**Sterna antillarum browni** Mearns. California Least Tern.**Thalasseus maximus** (Boddaert). Royal Tern.**Thalasseus elegans** (Gambel). Elegant Tern.**Hydroprogne caspia** (Pallas). Caspian Tern.**Hydroprogne caspia imperator** (Coues). Coues Caspian Tern.**Chlidonias nigra** (Linnaeus). Black Tern.**Chlidonias nigra surinamensis** (Gmelin). American Black Tern.Family **ALCIDAE** Auks, Murres, etc.**Endomychura hypoleuca** (Xantus). Xantus Murrelet.**Endomychura craveri** (Salvadori). Craveri Murrelet.**Synthliboramphus antiquus** (Gmelin). Ancient Murrelet.**Ptychoramphus aleuticus** (Pallas). Cassin Auklet.**Cerorhinca monocerata** (Pallas). Rhinoceros Auklet.

Order COLUMBIFORMES Pigeon-like Birds

Family COLUMBIDAE Pigeons and Doves

Columba fasciata Say. Band-tailed Pigeon.

Columba fasciata Say. Northern Band-tailed Pigeon.

Columba fasciata vioscae Brewster. Viosca Band-tailed Pigeon.

Zenaidura macroura (Linnaeus). Mourning Dove.

Zenaidura macroura marginella (Woodhouse). Western Mourning Dove.

Melopelia asiatica (Linnaeus). White-winged Dove.

Melopelia asiatica mearnsi Ridgway. Western White-winged Dove.

Chamaepelia passerina (Linnaeus). Ground Dove.

Chamaepelia passerina pallescens Baird. Mexican Ground Dove.

Order CUCULIFORMES Cuckoo-like Birds

Family CUCULIDAE Cuckoos, etc.

Coccyzus americanus (Linnaeus). Yellow-billed Cuckoo.

Coccyzus americanus occidentalis Ridgway. California Yellow-billed Cuckoo.

Geococcyx californianus (Lesson). California Road-runner.

Crotophaga sulcirostris Swainson. Groove-billed Ani.

Crotophaga sulcirostris pallidula Bangs and Penard. Lower California Groove-billed Ani.

Order STRIGIFORMES Owl-like Birds

Family TYTONIDAE Barn Owls

Tyto alba (Scopoli). Barn Owl.

Tyto alba pratincola (Bonaparte). American Barn Owl.

Family STRIGIDAE Eared Owls

Otus asio (Linnaeus). Screech Owl.

Otus asio quercinus Grinnell. Pasadena Screech Owl.

Otus asio gilmani Swarth. Sahuaro Screech Owl.

Otus asio cineraceus (Ridgway). Mexican Screech Owl.

Otus asio xantusi (Brewster). Xantus Screech Owl.

Bubo virginianus (Gmelin). Great Horned Owl.

Bubo virginianus pallescens Stone. Western Great Horned Owl.

Bubo virginianus pacificus Cassin. Pacific Great Horned Owl.

Bubo virginianus elachistus Brewster. Dwarf Great Horned Owl.

Glaucidium gnoma Wagler. Pigmy Owl.

Glaucidium gnoma hoskinsii Brewster. Hoskins Pigmy Owl.

Micropallas whitneyi (J. G. Cooper). Elf Owl.

Micropallas whitneyi sanfordi Ridgway. Sanford Elf Owl.

Speotyto cunicularia (Molina). Burrowing Owl.

Speotyto cunicularia hypugaea (Bonaparte). Northern Burrowing Owl.

Asio wilsonianus (Lesson). American Long-eared Owl.

Asio flammeus (Pontoppidan). Short-eared Owl.

Asio flammeus flammeus (Pontoppidan). Northern Short-eared Owl.

Order CAPRIMULGIFORMES Goatsucker-like Birds

Family CAPRIMULGIDAE Goatsuckers

Phalaenoptilus nuttallii (Audubon). Poor-will.

Phalaenoptilus nuttallii californicus Ridgway. Dusky Poor-will.

Phalaenoptilus nuttallii hueyi Dickey. Colorado Desert Poor-will.

Phalaenoptilus nuttallii dickeyi Grinnell. San Ignacio Poor-will.

Chordeiles acutipennis (Boddaert). Sharp-winged Nighthawk.

Chordeiles acutipennis texensis Lawrence. Texas Sharp-winged Nighthawk.

Chordeiles acutipennis inferior Oberholser. San Lucas Sharp-winged Nighthawk.

Order MICROPODIIFORMES Swift-like Birds

Family MICROPODIDAE Swifts

Nephoecetes niger (Gmelin). Black Swift.

Nephoecetes niger borealis (Kennerly). Northern Black Swift.

Chaetura vauxii (J. K. Townsend). Vaux Swift.

Aëronautes melanoleucus (Baird). White-throated Swift.

Family TROCHILIDAE Hummingbirds

Archilochus alexandri (Bourcier and Mulsant). Black-chinned Hummingbird.

Calypte costae (Bourcier). Costa Hummingbird.

Calypte anna (Lesson). Anna Hummingbird.

Selasphorus rufus (Gmelin). Rufous Hummingbird.

Selasphorus alleni Henshaw. Allen Hummingbird.

Stellula calliope (Gould). Calliope Hummingbird.

Basilinna xantusii (Lawrence). Xantus Hummingbird.

Order CORACIIFORMES Roller-like Birds

Family ALCEDINIDAE Kingfishers

Megaceryle alcyon (Linnaeus). Belted Kingfisher.

Megaceryle alcyon caurina (Grinnell). Northwestern Belted Kingfisher.

Order PICIFORMES Woodpecker-like Birds

Family **PICIDAE** Woodpeckers**Colaptes cafer** (Gmelin). Red-shafted Flicker.*Colaptes cafer collaris* Vigors. Monterey Red-shafted Flicker.*Colaptes cafer martirensis* Grinnell. San Pedro Mártir Red-shafted Flicker.*Colaptes cafer rufipileus* Ridgway. Guadalupe Red-shafted Flicker.**Colaptes chrysoides** (Malherbe). Gilded Flicker.*Colaptes chrysoides mearnsi* Ridgway. Mearns Gilded Flicker.*Colaptes chrysoides brunescens* Anthony. San Fernando Gilded Flicker.*Colaptes chrysoides chrysoides* (Malherbe). San Lucas Gilded Flicker.**Centurus uropygialis** Baird. Gila Woodpecker.*Centurus uropygialis uropygialis* Baird. Arizona Gila Woodpecker.*Centurus uropygialis cardonensis* Grinnell. San Fernando Gila Woodpecker.*Centurus uropygialis brewsteri* Ridgway. San Lucas Gila Woodpecker.**Balanosphyra formicivora** (Swainson). Acorn-storing Woodpecker.*Balanosphyra formicivora martirensis* Grinnell and Swarth. San Pedro Mártir Acorn-storing Woodpecker.*Balanosphyra formicivora angustifrons* (Baird). Narrow-fronted Acorn-storing Woodpecker.**Asyndesmus lewisi** Riley. Lewis Woodpecker.**Sphyrapicus varius** (Linnaeus). Sapsucker.*Sphyrapicus varius nuchalis* Baird. Red-naped Yellow-bellied Sapsucker.*Sphyrapicus varius daggetti* Grinnell. Sierra Nevada Red-breasted Sapsucker.**Sphyrapicus thyroideus** (Cassin). Williamson Sapsucker.*Sphyrapicus thyroideus thyroideus* (Cassin). Pacific Williamson Sapsucker.**Dryobates villosus** (Linnaeus). Hairy Woodpecker.*Dryobates villosus scrippsae* Huey. Lower California Hairy Woodpecker.**Dryobates scalaris** (Wagler). Ladder-backed Woodpecker.*Dryobates scalaris cactophilus* Oberholser. Cactus Ladder-backed Woodpecker.*Dryobates scalaris eremicus* Oberholser. San Fernando Ladder-backed Woodpecker.*Dryobates scalaris lucasanus* (Xantus). San Lucas Ladder-backed Woodpecker.**Dryobates nuttallii** (Gambel). Nuttall Ladder-backed Woodpecker.

Order PASSERIFORMES Sparrow-like Birds

Family **TYRANNIDAE** Tyrant Flycatchers**Tyrannus verticalis** Say. Western Kingbird.**Tyrannus vociferans** Swainson. Cassin Kingbird.**Myiarchus magister** Ridgway. Great Crested Flycatcher.*Myiarchus magister magister* Ridgway. Arizona Great Crested Flycatcher.

Myiarchus cinerascens (Lawrence). Ash-throated Flycatcher.**Myiarchus cinerascens cinerascens** (Lawrence). Northern Ash-throated Flycatcher.**Myiarchus cinerascens pertinax** Baird. Lower California Ash-throated Flycatcher.**Sayornis phoebe** (Latham). Eastern Phoebe.**Sayornis saya** (Bonaparte). Say Phoebe.**Sayornis saya saya** (Bonaparte). Rocky Mountain Say Phoebe.**Sayornis saya quiescens** Grinnell. San José Say Phoebe.**Sayornis nigricans** (Swainson). Black Phoebe.**Sayornis nigricans salictaria** Grinnell. San Quintín Black Phoebe.**Sayornis nigricans brunescens** Grinnell. San Lucas Black Phoebe.**Empidonax traillii** (Audubon). Traill Flycatcher.**Empidonax traillii brewsteri** Oberholser. Western Traill Flycatcher.**Empidonax hammondii** (Xantus). Hammond Flycatcher.**Empidonax wrightii** Baird. Wright Flycatcher.**Empidonax griseus** Brewster. Gray Flycatcher.**Empidonax difficilis** Baird. Western Flycatcher.**Empidonax difficilis difficilis** Baird. Yellow-bellied Western Flycatcher.**Empidonax difficilis cineritius** Brewster. San Lucas Western Flycatcher.**Myiochanes virens** (Linnaeus). Wood Pewee.**Myiochanes virens richardsonii** (Swainson). Western Wood Pewee.**Myiochanes virens peninsulae** (Brewster). Large-billed Wood Pewee.**Nuttallornis mesoleucus** (Lichtenstein). Olive-sided Flycatcher.**Nuttallornis mesoleucus majorinus** Bangs and Peckard. Greater Olive-sided Flycatcher.**Pyrocephalus rubinus** (Boddaert). Vermilion Flycatcher.**Pyrocephalus rubinus mexicanus** Selater. Mexican Vermilion Flycatcher.Family **ALAUDIDAE** Larks**Otocoris alpestris** (Linnaeus). Horned Lark.**Otocoris alpestris actia** Oberholser. California Horned Lark.**Otocoris alpestris enertera** Oberholser. Magdalena Horned Lark.**Otocoris alpestris leucolaema** (Coues). Desert Horned Lark.**Otocoris alpestris leucansiptila** Oberholser. Yuma Horned Lark.Family **HIRUNDINIDAE** Swallows**Tachycineta thalassina** (Swainson). Violet-green Swallow.**Tachycineta thalassina lepida** Mearns. Northern Violet-green Swallow.**Tachycineta thalassina brachyptera** Brewster. San Lucas Violet-green Swallow.**Iridoprocne bicolor** (Vieillot). Tree Swallow.**Riparia riparia** (Linnaeus). Bank Swallow.**Riparia riparia riparia** (Linnaeus). Common Bank Swallow.**Stelgidopteryx ruficollis** (Vieillot). Rough-winged Swallow.**Stelgidopteryx ruficollis serripennis** (Audubon). Northern Rough-winged Swallow.

Hirundo erythrogaster Boddaert. Barn Swallow.

Petrochelidon albifrons (Rafinesque). Cliff Swallow.

Petrochelidon albifrons albifrons (Rafinesque). Northern Cliff Swallow.

Progne subis (Linnaeus). Purple Martin.

Progne subis hesperia Brewster. Lower California Purple Martin.

Family **CORVIDAE** Crows, Jays, etc.

Cyanocitta stelleri (Gmelin). Steller Jay.

Cyanocitta stelleri frontalis (Ridgway). Blue-fronted Steller Jay.

Aphelocoma californica (Vigors). California Jay.

Aphelocoma californica obscura Anthony. Belding California Jay.

Aphelocoma californica hypoleuca Ridgway. Xantus California Jay.

Corvus corax Linnaeus. Raven.

Corvus corax sinuatus Wagler. Western Raven.

Corvus brachyrhynchos Brehm. American Crow.

Corvus brachyrhynchos hesperis Ridgway. Western American Crow.

Cyanocephalus cyanocephalus (Wied). Piñon Jay.

Nucifraga columbiana (Wilson). Clark Nutcracker.

Family **PARIDAE** Titmouses, Chickadees, etc.

Penthestes gambeli (Ridgway). Mountain Chickadee.

Penthestes gambeli atratus Grinnell and Swarth. San Pedro Mártir Mountain Chickadee.

Baeolophus inornatus (Gambel). Plain Titmouse.

Baeolophus inornatus murinus Ridgway. San Pedro Mártir Plain Titmouse.

Baeolophus inornatus cineraceus (Ridgway). Ashy Plain Titmouse.

Auriparus flaviceps (Sundevall). Verdin.

Auriparus flaviceps flaviceps (Sundevall). Arizona Verdin.

Auriparus flaviceps lamprocephalus Oberholser. San Lucas Verdin.

Psaltiriparus minimus (J. K. Townsend). Bush-tit.

Psaltiriparus minimus melanurus Grinnell and Swarth. Blackish-tailed Bush-tit.

Psaltiriparus minimus grindae Ridgway. Grinda Bush-tit.

Family **SITTIDAE** Nuthatches

Sitta carolinensis Latham. White-breasted Nuthatch.

Sitta carolinensis aculeata Cassin. Slender-billed White-breasted Nuthatch.

Sitta carolinensis alexandrae Grinnell. San Pedro Mártir White-breasted Nuthatch

Sitta carolinensis lagunae Brewster. San Lucas White-breasted Nuthatch.

Sitta canadensis Linnaeus. Red-breasted Nuthatch.

Sitta pygmaea Vigors. Pigmy Nuthatch.

Sitta pygmaea leuconucha Anthony. White-naped Pigmy Nuthatch.

Family **CHAMAEIDAE** Wren-tits**Chamaea fasciata** (Gambel). Wren-tit.

Chamaea fasciata canicauda Grinnell and Swarth. San Pedro Mártir Wren-tit.

Family **TROGLODYTIDAE** Wrens**Troglodytes aëdon** (Vieillot). House Wren.

Troglodytes aëdon parkmanii Audubon. Western House Wren.

Thryomanes bewickii (Audubon). Bewick Wren.

Thryomanes bewickii charienturus Oberholser. Sooty Bewick Wren.

Thryomanes bewickii cerroensis (Anthony). Cedros Bewick Wren.

Thryomanes brevicauda Ridgway. Guadalupe Bewick Wren.

Heleodytes brunneicapillus (Lafresnaye). Cactus Wren.

Heleodytes brunneicapillus couesi (Sharpe). Northern Cactus Wren.

Heleodytes brunneicapillus bryanti Anthony. Bryant Cactus Wren.

Heleodytes brunneicapillus affinis (Xantus). San Lucas Cactus Wren.

Telmatodytes palustris (Wilson). Marsh Wren.

Telmatodytes palustris plesius (Oberholser). Western Marsh Wren.

Telmatodytes palustris paludicola (Baird). Tule Marsh Wren.

Telmatodytes palustris aestuarinus Swarth. Suisun Marsh Wren.

Catherpes mexicanus (Swainson). Cañon Wren.

Catherpes mexicanus punctulatus Ridgway. Dotted Cañon Wren.

Catherpes mexicanus conspersus Ridgway. Nevada Cañon Wren.

Salpinctes obsoletus (Say). Rock Wren.

Salpinctes obsoletus obsoletus (Say). Northern Rock Wren.

Salpinctes obsoletus guadeloupensis Ridgway. Guadalupe Rock Wren.

Family **MIMIDAE** Mockingbirds, Thrashers, etc.**Mimus polyglottos** (Linnaeus). Mockingbird.

Mimus polyglottos leucopterus (Vigors). Western Mockingbird.

Toxostoma cinereum (Xantus). San Lucas Thrasher.

Toxostoma cinereum cinereum (Xantus). Cape San Lucas Thrasher.

Toxostoma cinereum mearnsi (Anthony). Mearns San Lucas Thrasher.

Toxostoma redivivum (Gambel). California Thrasher.

Toxostoma redivivum redivivum (Gambel). Southern California Thrasher.

Toxostoma lecontei Lawrence. Leconte Thrasher.

Toxostoma lecontei lecontei Lawrence. Gila Leconte Thrasher.

Toxostoma lecontei arenicola (Anthony). Santa Rosalia Leconte Thrasher.

Toxostoma crissale Henry. Crissal Thrasher.

Toxostoma crissale crissale Henry. Arizona Crissal Thrasher.

Toxostoma crissale trinitatis Grinnell. Trinidad Crissal Thrasher.

Oroscoptes montanus (J. K. Townsend). Sage Thrasher.

Family **TURDIDAE** Thrushes

Turdus migratorius Linnaeus. Robin.

Turdus migratorius propinquus Ridgway. Western Robin.

Turdus confinis Baird. San Lucas Robin.

Ixoreus naevius (Gmelin). Varied Thrush.

Ixoreus naevius meruloides (Swainson). Northern Varied Thrush.

Hylocichla guttata (Pallas). Hermit Thrush.

Hylocichla guttata guttata (Pallas). Alaska Hermit Thrush.

Hylocichla guttata nanus (Audubon). Dwarf Hermit Thrush.

Hylocichla guttata slevini Grinnell. Monterey Hermit Thrush.

Hylocichla guttata auduboni (Baird). Audubon Hermit Thrush.

Hylocichla ustulata (Nuttall). Russet-backed Thrush.

Hylocichla ustulata ustulata (Nuttall). Russet-backed Thrush.

Hylocichla ustulata swainsoni (Tschudi). Olive-backed Thrush.

Sialia mexicana Swainson. Mexican Bluebird.

Sialia mexicana occidentalis J. K. Townsend. Western Mexican Bluebird.

Sialia mexicana anabelae Anthony. San Pedro Mártir Mexican Bluebird.

Sialia currucoides (Bechstein). Mountain Bluebird.

Myadestes townsendi (Audubon). Townsend Solitaire.

Family **SYLVIIDAE** Old-World Warblers, Kinglets, etc.

Poliophtila caerulea (Linnaeus). Blue-gray Gnatcatcher.

Poliophtila caerulea amoenissima Grinnell. Western Blue-gray Gnatcatcher.

Poliophtila caerulea obscura Ridgway. San Lucas Blue-gray Gnatcatcher.

Poliophtila melanura Lawrence. Black-tailed Gnatcatcher.

Poliophtila melanura melanura Lawrence. Plumbeous Black-tailed Gnatcatcher.

Poliophtila melanura californica Brewster. California Black-tailed Gnatcatcher.

Poliophtila melanura margaritae Ridgway. Santa Margarita Black-tailed Gnatcatcher.

Poliophtila melanura abbreviata Grinnell. San Lucas Black-tailed Gnatcatcher.

Corthylio calendula (Linnaeus). Ruby-crowned Kinglet.

Corthylio calendula calendula (Linnaeus). Eastern Ruby-crowned Kinglet.

Corthylio calendula cineraceus (Grinnell). Western Ruby-crowned Kinglet.

Corthylio calendula obscurus (Ridgway). Dusky Ruby-crowned Kinglet.

Family **MOTACILLIDAE** Wagtails

Motacilla ocularis Swinhoe. Swinhoe Wagtail.

Anthus rubescens (Tunstall). American Pipit.

Anthus cervinus (Pallas). Red-throated Pipit.

Family **BOMBYCILLIDAE** Waxwings

Bombycilla cedrorum Vieillot. Cedar Waxwing.

Family **PTILOGONATIDAE** Silky Flycatchers**Phainopepla nitens** (Swainson). Phainopepla.**Phainopepla nitens lepida** Van Tyne. Northern Phainopepla.Family **LANIIDAE** Shrikes**Lanius ludovicianus** Linnaeus. Loggerhead Shrike.**Lanius ludovicianus gambeli** Ridgway. California Loggerhead Shrike.**Lanius ludovicianus excubitorides** Swainson. White-rumped Loggerhead Shrike.**Lanius ludovicianus grinnelli** Oberholser. Grinnell Loggerhead Shrike.**Lanius ludovicianus nelsoni** Oberholser. Nelson Loggerhead Shrike.Family **VIREONIDAE** Vireos**Vireo bellii** Audubon. Bell Vireo.**Vireo bellii pusillus** Coues. Least Bell Vireo.**Vireo vicinior** Coues. Gray Vireo.**Vireo huttoni** Cassin. Hutton Vireo.**Vireo huttoni huttoni** Cassin. California Hutton Vireo.**Vireo huttoni cognatus** Ridgway. San Lucas Hutton Vireo.**Vireo solitarius** (Wilson). Solitary Vireo.**Vireo solitarius cassinii** Xantus. Cassin Solitary Vireo.**Vireo solitarius lucasanus** Brewster. San Lucas Solitary Vireo.**Vireo gilvus** (Vieillot). Warbling Vireo.**Vireo gilvus swainsoni** Baird. Western Warbling Vireo.Family **MNIOTILTIDAE** Wood Warblers**Mniotilta varia** (Linnaeus). Black-and-white Warbler.**Vermivora luciae** (J. G. Cooper). Lucy Warbler.**Vermivora ruficapilla** (Wilson). Nashville Warbler.**Vermivora ruficapilla gutturalis** (Ridgway). Calaveras Nashville Warbler.**Vermivora celata** (Say). Orange-crowned Warbler.**Vermivora celata celata** (Say). Eastern Orange-crowned Warbler.**Vermivora celata orestera** Oberholser. Rocky Mountain Orange-crowned Warbler.**Vermivora celata lutescens** (Ridgway). Lutescent Orange-crowned Warbler.**Vermivora celata sordida** (C. H. Townsend). Dusky Orange-crowned Warbler.**Compsothlypis graysoni** Ridgway. Socorro Warbler.**Dendroica aestiva** (Gmelin). Yellow Warbler.**Dendroica aestiva sonorana** Brewster. Sonora Yellow Warbler.**Dendroica aestiva brewsteri** Grinnell. California Yellow Warbler.**Dendroica aestiva rubiginosa** (Pallas). Alaska Yellow Warbler.

- Dendroica erithachorides** Baird. Golden Warbler.
Dendroica erithachorides castaneiceps Ridgway. Mangrove Golden Warbler.
- Dendroica coronata** (Linnaeus). Myrtle Warbler.
Dendroica coronata hooveri McGregor. Alaska Myrtle Warbler.
- Dendroica auduboni** (J. K. Townsend). Audubon Warbler.
Dendroica auduboni auduboni (J. K. Townsend). Pacific Audubon Warbler.
Dendroica auduboni memorabilis Oberholser. Rocky Mountain Audubon Warbler.
- Dendroica cerulea** (Wilson). Cerulean Warbler.
- Dendroica nigrescens** (J. K. Townsend). Black-throated Gray Warbler.
- Dendroica townsendi** (J. K. Townsend). Townsend Warbler.
- Dendroica occidentalis** (J. K. Townsend). Hermit Warbler.
- Seiurus noveboracensis** (Gmelin). Water-thrush.
Seiurus noveboracensis notabilis Ridgway. Alaska Water-thrush.
- Oporornis tolmiei** (J. K. Townsend). Tolmie Warbler.
- Geothlypis trichas** (Linnaeus). Yellow-throat.
Geothlypis trichas occidentalis Brewster. Western Yellow-throat.
Geothlypis trichas scirpicola Grinnell. Tule Yellow-throat.
- Geothlypis beldingi** Ridgway. Belding Yellow-throat.
Geothlypis beldingi goldmani Oberholser. Goldman Belding Yellow-throat.
Geothlypis beldingi beldingi Ridgway. Cape Belding Yellow-throat.
- Icteria virens** (Linnaeus). Yellow-breasted Chat.
Icteria virens longicauda Lawrence. Long-tailed Yellow-breasted Chat.
- Wilsonia pusilla** (Wilson). Pileolated Warbler.
Wilsonia pusilla pileolata (Pallas). Alaska Pileolated Warbler.
Wilsonia pusilla chrysola Ridgway. Golden Pileolated Warbler.
- Setophaga ruticilla** (Linnaeus). American Redstart.
- Euthlypis lachrymosa** Cabanis. Fan-tailed Warbler.
Euthlypis lachrymosa tephra Ridgway. Western Fan-tailed Warbler.

Family **ICTERIDAE** American Orioles and Blackbirds

- Sturnella neglecta** Audubon. Western Meadowlark.
- Xanthocephalus xanthocephalus** (Bonaparte). Yellow-headed Blackbird.
- Agelaius phoeniceus** (Linnaeus). Red-winged Blackbird.
Agelaius phoeniceus sonoriensis Ridgway. Sonora Red-winged Blackbird.
Agelaius phoeniceus neutralis Ridgway. San Diego Red-winged Blackbird.
- Agelaius tricolor** (Audubon). Tri-colored Red-winged Blackbird.
- Icterus parisorum** Bonaparte. Scott Oriole.
- Icterus cucullatus** Swainson. Hooded Oriole.
Icterus cucullatus nelsoni Ridgway. Arizona Hooded Oriole.
Icterus cucullatus trochiloides Grinnell. San Lucas Hooded Oriole.
- Icterus bullockii** (Swainson). Bullock Oriole.
- Euphagus carolinus** (Müller). Rusty Blackbird.
- Euphagus cyanocephalus** (Wagler). Brewer Blackbird.
Euphagus cyanocephalus minusculus Grinnell. California Brewer Blackbird.

Molothrus ater (Boddaert). Cowbird.**Molothrus ater artemisiae** Grinnell. Nevada Cowbird.**Molothrus ater californicus** Dickey and van Rossem. California Cowbird.**Molothrus ater obscurus** (Gmelin). Dwarf Cowbird.Family **THRAUPIDAE** Tanagers**Piranga ludoviciana** (Wilson). Western Tanager.**Piranga rubra** (Linnaeus). Summer Tanager.**Piranga rubra rubra** (Linnaeus). Eastern Summer Tanager.**Piranga rubra cooperi** Ridgway. Cooper Summer Tanager.Family **FRINGILLIDAE** Finches**Richmondia cardinalis** (Linnaeus). Cardinal.**Richmondia cardinalis ignea** (Baird). San Lucas Cardinal.**Pyrrhuloxia sinuata** (Bonaparte). Pyrrhuloxia.**Pyrrhuloxia sinuata peninsulae** Ridgway. San Lucas Pyrrhuloxia.**Zamelodia melanocephala** (Swainson). Black-headed Grosbeak.**Zamelodia melanocephala capitalis** (Baird). Pacific Black-headed Grosbeak.**Guiraca caerulea** (Linnaeus). Blue Grosbeak.**Guiraca caerulea interfusa** Dwight and Griscom. Arizona Blue Grosbeak.**Guiraca caerulea salicarius** Grinnell. California Blue Grosbeak.**Passerina amoena** (Say). Lazuli Bunting.**Passerina versicolor** (Bonaparte). Varied Bunting.**Passerina versicolor pulchra** Ridgway. Beautiful Varied Bunting.**Spiza americana** (Gmelin). Dickcissel.**Carpodacus purpureus** (Gmelin). Purple Finch.**Carpodacus purpureus californicus** Baird. California Purple Finch.**Carpodacus cassinii** Baird. Cassin Purple Finch.**Carpodacus mexicanus** (Müller). Linnet.**Carpodacus mexicanus frontalis** (Say). California Linnet.**Carpodacus mexicanus ruberrimus** Ridgway. San Lucas Linnet.**Carpodacus mexicanus clementis** Mearns. San Clemente Linnet.**Carpodacus mcgregori** Anthony. McGregor Linnet.**Carpodacus amplus** Ridgway. Guadalupe Linnet.**Spinus pinus** (Wilson). Pine Siskin.**Spinus pinus pinus** (Wilson). Northern Pine Siskin.**Spinus pinus macropterus** (Bonaparte). Mexican Pine Siskin.**Spinus tristis** (Linnaeus). American Goldfinch.**Spinus tristis salicamans** Grinnell. Willow American Goldfinch.**Spinus psaltria** (Say). Arkansas Goldfinch.**Spinus psaltria hesperophilus** (Oberholser). Green-backed Arkansas Goldfinch.

Spinus lawrencei (Cassin). Lawrence Goldfinch.

Loxia curvirostra Linnaeus. Red Crossbill.

Loxia curvirostra bendirei Ridgway. Bendire Red Crossbill.

Loxia curvirostra stricklandi Ridgway. Mexican Red Crossbill.

Oberholseria chlorura (Audubon). Green-tailed Towhee.

Pipilo maculatus Swainson. Spotted Towhee.

Pipilo maculatus megalonyx Baird. San Diego Spotted Towhee.

Pipilo maculatus umbraticola Grinnell and Swarth. Cape Colnett Spotted Towhee.

Pipilo maculatus magnirostris Brewster. Large-billed Spotted Towhee.

Pipilo consobrinus Ridgway. Guadalupe Spotted Towhee.

Pipilo fuscus Swainson. Brown Towhee.

Pipilo fuscus crissalis (Vigors). California Brown Towhee.

Pipilo fuscus senicula Anthony. Anthony Brown Towhee.

Pipilo fuscus aripolius Oberholser. San Pablo Brown Towhee.

Pipilo fuscus albigula Baird. San Lucas Brown Towhee.

Pipilo aberti Baird. Abert Towhee.

Calamospiza melanocorys Stejneger. Lark Bunting.

Passerculus sandwichensis (Gmelin). Savannah Sparrow.

Passerculus sandwichensis alaudinus Bonaparte. Western Savannah Sparrow.

Passerculus sandwichensis nevadensis Grinnell. Nevada Savannah Sparrow.

Passerculus sandwichensis anthinus Bonaparte. Kadiak Savannah Sparrow.

Passerculus beldingi Ridgway. Belding Marsh Sparrow.

Passerculus rostratus (Cassin). Large-billed Marsh Sparrow.

Passerculus rostratus guttatus Lawrence. San Benito Marsh Sparrow.

Passerculus rostratus halophilus (McGregor). Laguna Marsh Sparrow.

Passerculus rostratus rostratus (Cassin). Large-billed Marsh Sparrow.

Ammodramus savannarum (Gmelin). Grasshopper Sparrow.

Ammodramus savannarum bimaculatus Swainson. Western Grasshopper Sparrow.

Poocetes gramineus (Gmelin). Vesper Sparrow.

Poocetes gramineus confinis Baird. Western Vesper Sparrow.

Poocetes gramineus affinis G. S. Miller. Oregon Vesper Sparrow.

Chondestes grammacus (Say). Lark Sparrow.

Chondestes grammacus strigatus Swainson. Western Lark Sparrow.

Aimophila ruficeps (Cassin). Rufous-crowned Sparrow.

Aimophila ruficeps canescens Todd. Ashy Rufous-crowned Sparrow.

Aimophila ruficeps lambi Grinnell. Cape Colnett Rufous-crowned Sparrow.

Aimophila ruficeps sororia Ridgway. Laguna Rufous-crowned Sparrow.

Amphispiza belli (Cassin). Bell Sparrow.

Amphispiza belli belli (Cassin). California Bell Sparrow.

Amphispiza belli cinerea C. H. Townsend. Gray Bell Sparrow.

Amphispiza belli canescens Grinnell. California Sage Sparrow.

Amphispiza belli nevadensis (Ridgway). Nevada Sage Sparrow.

Amphispiza bilineata (Cassin). Black-throated Sparrow.

Amphispiza bilineata deserticola Ridgway. Desert Black-throated Sparrow.

Amphispiza bilineata bangsi Grinnell. San Lucas Black-throated Sparrow.

Junco hyemalis (Linnaeus). Slate-colored Junco.

Junco hyemalis hyemalis (Linnaeus). Eastern Slate-colored Junco.

Junco oreganus (J. K. Townsend). Oregon Junco.

Junco oreganus shufeldti Coale. Shufeldt Oregon Junco.

Junco oreganus thurberi Anthony. Sierra Nevada Oregon Junco.

Junco oreganus pontillis Oberholser. Hanson Laguna Oregon Junco.

Junco oreganus townsendi Anthony. Townsend Oregon Junco.

Junco insularis Ridgway. Guadalupe Junco.

Junco bairdi Ridgway. Baird Junco.

Spizella passerina (Bechstein). Chipping Sparrow.

Spizella passerina stridula Grinnell. Pacific Chipping Sparrow.

Spizella pallida (Swainson). Clay-colored Sparrow.

Spizella breweri Cassin. Brewer Sparrow.

Spizella atrogularis (Cabanis). Black-chinned Sparrow.

Spizella atrogularis cana Coues. California Black-chinned Sparrow.

Zonotrichia albicollis (Gmelin). White-throated Sparrow.

Zonotrichia coronata (Pallas). Golden-crowned Sparrow.

Zonotrichia leucophrys (Forster). White-crowned Sparrow.

Zonotrichia leucophrys leucophrys (J. R. Forster). Hudsonian White-crowned Sparrow.

Zonotrichia leucophrys gambelli (Nuttall). Gambel White-crowned Sparrow.

Passerella iliaca (Merrem). Fox Sparrow.

Passerella iliaca altivagans Riley. Alberta Fox Sparrow.

Passerella iliaca schistacea Baird. Slate-colored Fox Sparrow.

Passerella iliaca canescens Swarth. White Mountains Fox Sparrow.

Passerella iliaca fulva Swarth. Warner Mountains Fox Sparrow.

Passerella iliaca moneensis Grinnell and Storer. Mono Fox Sparrow.

Passerella iliaca mariposae Swarth. Yosemite Fox Sparrow.

Passerella iliaca megarhynchus Baird. Thick-billed Fox Sparrow.

Passerella iliaca sinuosa Grinnell. Valdez Fox Sparrow.

Passerella iliaca unalaschcensis (Gmelin). Shumagin Fox Sparrow.

Melospiza lincolni (Audubon). Lincoln Sparrow.

Melospiza lincolni lincolni (Audubon). Northeastern Lincoln Sparrow.

Melospiza lincolni gracilis (Kittlitz). Forbush Lincoln Sparrow.

Melospiza melodia (Wilson). Song Sparrow.

Melospiza melodia cooperi Ridgway. San Diego Song Sparrow.

Melospiza melodia coronatorum Grinnell and Daggett. Los Coronados Islands Song Sparrow.

Melospiza melodia saltonis Grinnell. Salton Sink Song Sparrow.

Melospiza melodia rivularis W. E. Bryant. Brown Song Sparrow.

GENERAL ACCOUNTS OF THE SPECIES

NOTE.—The plan of treatment here adopted is as follows, the aim being to obtain a fair degree of uniformity. The sequence of species accords closely with the one presented in the third (1910) edition of the American Ornithologists' Union *Check-list*, so as to facilitate concordance with the great mass of the preceding literature. Each species heading consists of a full scientific name and a vernacular one, each chosen on the best grounds known to the author. A concise general statement follows, built upon a summation of all that is known concerning the species—as to its relative abundance, its seasonal status, geographic outlines of its range, and its zonal, faunal, and associational limitations.

Except for the most abundant species, all the authentic records of occurrence known are listed, with definite citations, so that, *via* the bibliography, anyone in the future can check them up. I have aimed to include in each account all the scientific names or combinations of names that have been applied to the species, so that the entry of these in the terminal index makes possible, ideally, the allocation of every ascription in the entire literature of Lower Californian ornithology. As a necessary stage in the preparation of the present contribution, I assembled in manuscript an exhaustive formal synonymy. This proved too voluminous to publish; but it is freely available for reference in the Museum of Vertebrate Zoology, and even for a student at a distance the references under any given species can easily be copied and sent him on application.

A further feature of each account is reference to what appears to have been chronologically the first ascription of the species to Lower California. Furthermore, in the case of each species or subspecies named from this territory, citation is given to the original description, and facts are given concerning the type and type locality. A good deal of new and important information has been dug up in these regards. Finally, since the present report is an institutional contribution, the nature of the materials contained in the Museum of Vertebrate Zoology, and their distributional bearing, are dealt with in some detail.

***Aechmophorus occidentalis* (Lawrence)**

Western Grebe

Winter visitant commonly to the Colorado delta region and in lesser numbers to nearly the entire Pacific seacoast of the peninsula north of the Cape district. Southernmost station of record, Magdalena Bay (Bryant, 1889*b*, p. 249; see also Willett, 1913, p. 20). Recorded first by Bryant (1886, p. 63) as found by him in January, 1885, at Cedros Island. C. H. Townsend (MS) took a specimen at Turtle Bay, November 8, 1884. W. M. Pierce (MS) saw several individuals, and obtained one, on a lagoon within the city limits of Ensenada, December 27, 1927. A specimen (skeleton) in the Museum of Vertebrate Zoology was obtained at San Quintín, December 18, 1925. While recorded in the Colorado delta, at Volcano Lake, up to June 11 (Oberholser, 1919*e*, p. 128), there is no positive evidence that the species breeds south of the United States boundary.

***Colymbus nigricollis californicus* (Heermann)**

American Eared Grebe

Winter visitant in numbers along both of the mainland coasts and around most, if not all, of the islands; also summering and nesting in favorable years in mountain lakes at the extreme north. Recorded south almost to the southern tip of the peninsula, at San José del Cabo (Brewster, 1902, p. 13). Some Gulf stations of known occurrence are: Ángel de la Guardia Island, San Francisquito Bay, Agua Verde Bay, and San Josef Island (Townsend, 1923, p. 4); Mulegé (Ogilvie-Grant, 1898, p. 536, under the name *Podiceps californicus*); Ildefonso Island, "large rafts" in first week of May, 1924 (C. C. Lamb, MS). Some Pacific-side stations are: Guadalupe Island (Rothschild and Hartert, 1902, p. 416); San Gerónimo Island, etc. (Kaeding, 1905, p. 106); Natividad Island (Lamb, 1927*a*, p. 68); Cedros Island, Magdalena Bay, etc. (Bryant, 1886, p. 63, and 1889*b*, p. 249); Pond Lagoon (Huey, 1927*g*, p. 243). First recorded, from San Quintín Bay, by Belding (1883*a*, p. 529, under the name *Dytes nigricollis californicus*). A specimen in the Museum of Vertebrate Zoology was collected at San Ramón, mouth of Santo Domingo River, December 15, 1925. Huey (1928*a*, p. 159) reports the species as breeding in favorable years at Laguna Hanson [5200 feet], on the Sierra Juárez.

***Colymbus dominicus brachypterus* Chapman**

Short-winged Santo Domingo Grebe

Formerly a common resident of fresh-water or brackish lagoons in the Cape district, whence recorded by Belding (1883*c*, p. 351, under the name *Tachybaptus dominicus*) from San José del Cabo, Miraflores, and Santiago. Found by Frazar, in 1887, breeding in numbers at the latter place (Brewster, 1902, p. 13); but curiously, only one person in the forty years since then seems to have found this species anywhere in Lower California: San José del Cabo, February 10, 1923, two specimens obtained (Lamb, 1927*b*, p. 155). The required type of habitat has largely disappeared. The first ascription to Lower California was by Coues (1872, p. 338, under the name *Podiceps dominicus*), but upon what evidence I do not know. The distinctness of this northern race from the form of *Colymbus dominicus* in the West Indies was confirmed by Brewster (*loc. cit.*).

Podilymbus podiceps podiceps (Linnaeus)

Northern Pied-billed Grebe

Fairly common winter visitant on lagoons and bays throughout the extent of the peninsula. Also resident and breeding locally. First recorded by Belding (1883b, p. 546), from the Cape district. Some other stations of known occurrence are: San Quintín Bay (Bryant, 1889b, p. 250, Howell, 1911, p. 152); Hardy River, in the Colorado delta (Stone and Rhoads, 1905, p. 681, Murphy, 1917, p. 81); Bay of La Paz and San José del Cabo (Brewster, 1902, p. 14); San José del Cabo and Todos Santos, latitude 23° 27', breeding (Lamb, 1927b, p. 155).

Gavia immer (Brünnich)

Common Loon

Rare winter visitant. Recorded only as follows: La Paz, January 27, 1883, two seen (Belding, 1883c, p. 352, under the name *Colymbus torquatus*; see Brewster, 1902, p. 15, under *Gavia immer*); San Quintín Bay, one shot in May (Bryant, 1889b, p. 250, under *Urinator immer*). Bishop (1921, p. 367) includes "Lower California" as within the winter range of his race *Gavia immer classon*, but upon what basis is not stated.

Gavia pacifica (Lawrence)

Pacific Loon

A winter visitant commonly south over the ocean along the Pacific seacoast, at least northerly, as also to the waters of the entire Gulf. Definite records are: Guadalupe Island (Ridgway, 1876b, p. 195, under *Colymbus arcticus pacificus*), this being the first published ascription of the species to Lower California; "the extremity of Lower California" (Baird, Brewer and Ridgway, 1884, p. 455, under the name *Urinator pacificus*); "Cape St. Lucas" (A. O. U. Comm., 1895b, p. 4); San Quintín (Willett, 1913, p. 20); near Todos Santos Islands, "extensive migration" May 20 to 22 (Nelson, 1921, p. 14); bay near Bluff Point, in the Gulf, "large numbers" April 15 (van Rossem, MS); La Paz Bay, "abundant" in February and March (Lamb, 1927b, p. 155); San Roque Bay, Pacific side, lat. 27° 8', "flock" April 10, and San Felipe, on the Gulf, April 1 (Huey, 1927c, p. 202, and 1927d, p. 16). An interesting case of probably waylaid migration was that at San José, 2500 feet altitude, latitude about 31°, where, on April 7 and 9, 1926, Miss Ada Meling captured and prepared three Pacific Loons (now nos. 47829-31, Mus. Vert. Zool.) that had appeared on the Meling ranch immediately after a severe storm. Appearance at this interior locality toward the base of the peninsula indicates the probability of the loons passing regularly overland in spring from the Gulf to the Pacific Ocean. Another skin in the Museum of Vertebrate Zoology is from San Ramon, mouth of Santo Domingo River, taken December 12, 1925.

Gavia stellata (Pontoppidan)

Red-throated Loon

Winter visitant northerly. Only one locality of occurrence: San Felipe, on the Gulf, specimen, found dead, obtained April 2, 1926, and several other carcasses found along the beach at about the same time (Huey, 1927d, p. 16); a skull of the same source is no. 51207, Mus. Vert. Zool., picked up by C. C. Lamb April 11, 1926.

***Cerorhinca monocerata* (Pallas)**

Rhinoceros Auklet

Sparing winter visitant along the Pacific seacoast northerly. First recorded by Heermann (1859, p. 75, under the name *Cerorhina occidentalis*) who procured a bird "during the winter . . . off the Island of Santa Marguerita, on the coast of Lower California." This remains the southernmost known station for the species. Subsequently reported as follows: Cedros Island (Bryant, 1886, p. 63); San Gerónimo Island (Kaeding, 1905, p. 106); Los Coronados Islands (Howell, 1917, p. 19); San Cristóbal Bay (Townsend, 1923, p. 5); Guadalupe Island and San Martín Island (McLellan, 1926, p. 282); El Rosario (specimen in L. B. Bishop coll., found by G. G. Cantwell "dead on ocean beach," April 9, 1926). Stragglers taken in June do not warrant considering the species "resident" in Lower Californian waters, as has been stated. The record from "San Miguel Island" (Ridgway, 1919, pp. 780, 781) probably pertains to upper California (see Ogilvie-Grant, 1898, p. 609).

***Ptychoramphus aleuticus* (Pallas)**

Cassin Auklet

Common resident on the ocean along nearly the whole western side of the peninsula. Southernmost place of observation, near Cape San Lucas (Lamb, 1910, p. 74), but only notably numerous north of about latitude 28° (Anthony, 1925, p. 280). Recorded as nesting on the following islands: Los Coronados (Grinnell and Daggett, 1903, p. 30, and many subsequent writers); Todos Santos (Kaeding, 1905, p. 106, *et al.*); San Martín (Kaeding, *loc. cit.*); San Gerónimo (Bryant, 1889b, p. 250, *et al.*); San Benitos (Anthony, 1900a, p. 28, *et al.*); Cedros (Willett, 1913, p. 20, *et al.*); Natividad (Thayer and Bangs, 1907b, p. 80, *et al.*); San Roque (Kaeding, *loc. cit.*, Bancroft, 1927b, p. 188, *et al.*); Asunción (Kaeding, *loc. cit.*). The last, near latitude 27°, is the southernmost known breeding ground. Birds also recorded from: Guadalupe Island (Thayer and Bangs, 1908, p. 104); off San Cristóbal Bay (Townsend, 1923, p. 5); Cape Colnett (Ridgway, 1919, p. 762). The first ascription of this species to Lower California was by Coues (1872, p. 343), but upon what basis I have not learned. Strangely, there is no known occurrence of this species on the Gulf of California.

***Synthliboramphus antiquus* (Gmelin)**

Ancient Murrelet

One specimen known, from the northwestern seacoast of Lower California, comprising the southernmost known occurrence of the species: No. 2311, coll. Wright M. Pierce; taken near Ensenada, December 25, 1927; a female, apparently adult, in winter plumage; examined by me and recorded here by permission of Mr. Pierce.

***Endomychura hypoleuca* (Xantus)**

Xantus Murrelet

Common resident on the ocean around the islands along the northern two-thirds of the Pacific side of the peninsula. First found at, and newly described from, Cape San Lucas by Xantus (1859, p. 299, under the name *Brachyrhamphus hypoleucus*). The type is now no. 13046 in the United States National Museum, the label showing that it was taken by Xantus July 14, 1859 (*vide* C. W. Richmond). Apparently rare so far south as that (see Brewster, 1902, p. 15,

under *Brachyramphus hypoleucus*). Recorded definitely as nesting on the following islands: Los Coronados (Lamb, 1909, p. 8, Howell, 1917, p. 22, and several other writers); Todos Santos (Van Denburgh, 1924, p. 68, *et al.*); San Martín and San Gerónimo (Kaeding, 1905, p. 107); San Benitos (Anthony, 1900a, p. 29, *et al.*). Recorded also from near Guadalupe Island (Thayer and Bangs, 1908, p. 104, under *Micruria hypoleuca*, *et al.*), near San Martín Island (Howell, 1911,

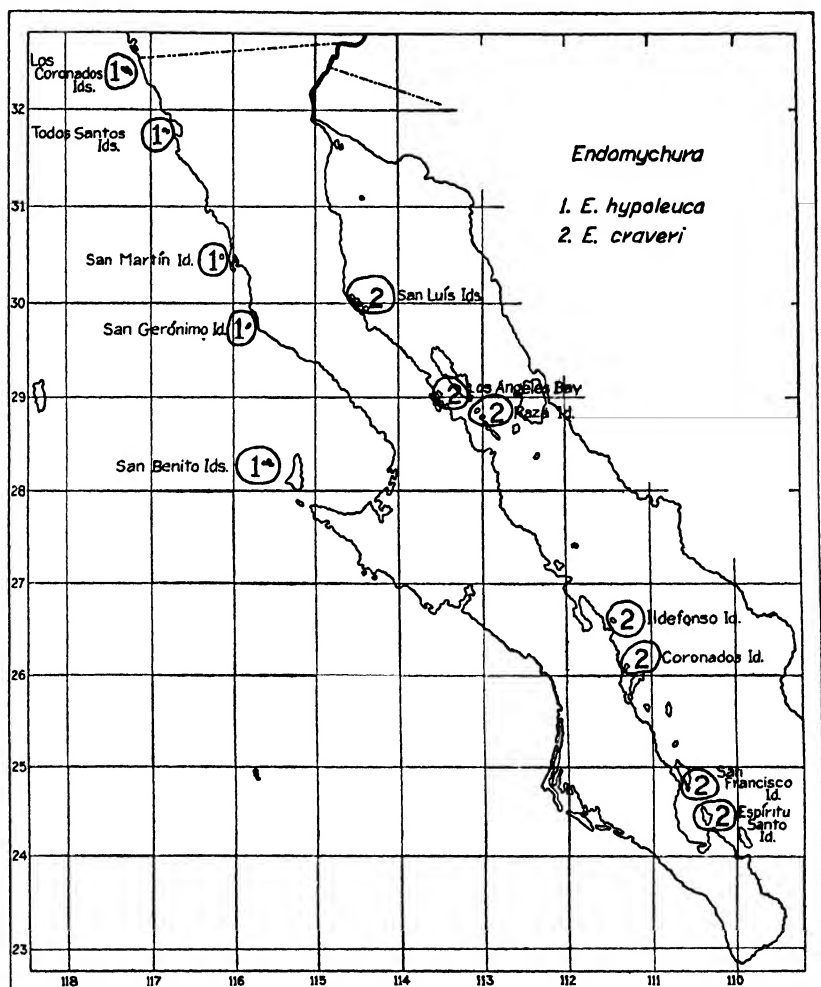


Fig. 2. Breeding places of Murrelets, genus *Endomychura*, in Lower California.

p. 151, *et al.*), near Natividad Island (Lamb, 1927a, p. 68), near Magdalena Bay (Anthony, 1925, p. 280), etc. The latter is the southernmost recent station of record. Curiously, there is no known occurrence of this murrelet in the Gulf of California (see van Rossem, 1928a, p. 80). Coues (1872, p. 344) lumped this species with the Craveri Murrelet under the name *Synthliborhamphus wurmianus*.

Endomychura craveri (Salvadori)

Craveri Murrelet

Resident commonly in the Gulf of California, and occurs also, at non-breeding times, on the ocean off the Pacific side of the peninsula. Definitely known breeding places are all in the Gulf: San Luis Islands (Bancroft, 1927*b*, p. 188); Los Angeles Bay (van Rossem, 1926*a*, p. 83, under the name *Brachyrhamphus craveri*); Raza Island (Streets, 1877, p. 32, under *Brachyrhamphus craveri*, and other writers); Ildefonso Island (Thayer, 1909*d*, p. 101, 1911, p. 106); Coronados Islands, near latitude 26° (van Rossem, *loc. cit.*); [San Francisco Island] near San José Island (Thayer, 1909*b*, p. 143); near Espiritu Santo Island (Brewster, 1902, p. 19). Also "probably" breeds on Consag Rock (Bancroft, *loc. cit.*). Pacific-side records of birds include definitely only the vicinity of Los Coronados Islands (van Rossem, 1915, p. 74). The species was first recorded, and described, by Salvadori (1865, p. 387, under the name *Uria Craveri*) from, assumably, Natividad Island, but far more likely from some island in the Gulf, probably Raza (see Cooke, 1916, p. 80); type in Turin Museum (*vide* Ridgway, 1919, p. 754). However, this murrelet had been taken by Xantus several years previously, in 1859, at Cape San Lucas (see Ridgway, in Belding, 1883*b*, p. 534). The systematic status of the Craveri Murrelet has been much discussed, as by Anthony (1900*c*, p. 168, under the name *Micruria craveri*); the last and seemingly final word is by van Rossem (1926*a*, p. 80).

Stercorarius parasiticus (Linnaeus)

Parasitic Jaeger

While very likely a regular migrant over the ocean along the Pacific side of the peninsula, there are but few definite records, as follows: One taken about 30 miles west of San Martín Island, July 10, 1905 (Gifford, 1913, p. 46, under the name *Stercorarius crepidatus*); three or four noted south of Abreojos Point, lat. 26° 40', July 31, 1922 (Anthony, 1925, p. 280); one seen off Abreojos Point, April 10, 1927, and one off the entrance to Pond Lagoon, April 19, 1927 (Huey, 1927*g*, p. 243); one taken near Punta Banda, December 25, 1927 (W. M. Pierce, MS). The last instance indicates occasional wintering of the species on Lower Californian waters.

Bissa tridactyla pollicaris Stejneger

Pacific Kittiwake

Winter visitant off the northwestern base of the peninsula; two records: San Gerónimo Island, "a few" seen and one taken March 15 and (or) 17, 1897; and vicinity of Los Coronados Islands, of "regular, though not common occurrence" in winter (Anthony, 1898*d*, p. 267, Kaeding, 1905, p. 107).

Larus glaucescens Naumann

Glaucous-winged Gull

Winter visitant on both sides of the peninsula its whole length; most common at the north. Localities of recorded occurrence are as follows: On the Pacific side: Todos Santos, San Martín, San Gerónimo and Guadalupe islands, and San Ramón (Kaeding, 1905, p. 107, Van Denburgh, 1924, p. 68, and Huey, 1928, p. 350); Natividad Island (Lamb, 1927*a*, p. 68); San Ignacio Lagoon (Huey, 1927*g*, p. 240). In the Gulf: San Felipe (Huey, 1927*d*, p. 16, and specimen in Mus. Vert. Zool. taken April 13, 1926), and Bluff Point, about lat. 29° 30' (van

Rossem, MS). The southernmost known point of occurrence in the general range of this species is San José del Cabo, where found in small numbers throughout late winter, 1923 (C. C. Lamb, MS).

***Larus occidentalis wymani* Dickey and van Rossem**

Southern Western Gull

Common resident along the Pacific side of the peninsula for about the northern two-thirds of its length. Breeds on nearly all of the coastal islands, from Los Coronados near the United States boundary south as far as Asunción, lat. 27° (Kaeding, 1905, p. 107, under the name *Larus occidentalis*); possibly south to Magdalena Bay, near lat. 25° (Anthony, 1925, p. 281—locality of small young observed, not clearly apparent). Lamb (1910, p. 74) states that, in going south by boat in March, the Western Gull was last seen off Magdalena Bay. From this and other similar evidence, it is likely that there is a hiatus to the south of latitude 25° between the ranges of *L. o. wymani* and *L. o. livens*. Breeds on Guadalupe Island (Bryant, 1887a, p. 274, *et al.*), but not in the large numbers there as on the many small islands close to the mainland of the peninsula. The first record of Western Gull probably referable to the present race was by Saunders (1875, p. 158, under the name *Larus fuscus*). Birds from the Pacific side of the peninsula have sometimes been referred to under the name *L. o. livens* (for example, by Huey, 1924b, p. 586). Specimens of positively the present race are in the Museum of Vertebrate Zoology from San Martín Island, July 13 and 15, and Todos Santos Islands, January 16.

***Larus occidentalis livens* Dwight**

Yellow-footed Western Gull

Common resident within the Gulf of California. Known definitely to breed on the Lower Californian side of the Gulf at many points from Consag Rock, near lat. 31°, south to San José Island, lat. 25° (Dickey and van Rossem, 1925 p. 164). While common at San Felipe (Huey, 1927d, p. 17) and probably in winter thence up into the delta as far as the water is salt, the records of Price (1899, p. 90) and Rhoads (1905, p. 687) for the Colorado River in the upper parts of the delta were probably faulty. Western Gulls, recorded under the name *Larus occidentalis*, have been reported as more or less common in winter around the shores of the Cape district, as on La Paz Bay, at San José del Cabo, and at Cape San Lucas (Belding, 1883b, p. 549, Brewster, 1902, p. 20, Anthony, 1898e, p. 313); while no chance for verifying the subspecies here concerned has presented itself, I think it most likely that it was *livens*. The first record of any gull from Lower California likely to have been of the race *livens* was by Streets (1877, p. 25, under the name *Larus argentatus occidentalis*). The subspecies *L. o. livens* was originally named by Dwight (1919a, p. 11), with type [no. 3378 in L. C. Sanford coll., Am. Mus. Nat. Hist.] from San José Island, collected by W. W. Brown, Jr., April 26, 1912. The Museum of Vertebrate Zoology contains a small series from San Felipe Bay, taken March 29 and 30, April 3, 4, 9, and 13, 1926.

***Larus argentatus smithsonianus* Coues**

American Herring Gull

Sparing winter visitant south along both coasts of the peninsula to its extremity. First reported by Bryant (1886, p. 63), from Cedros Island. Other stations of definite occurrence are: Colorado delta, February (Rhoads, 1905, p. 687, under the name *Larus argentatus*); San Felipe, April 4 (two skins in Mus. Vert. Zool.); San José del Cabo, April 20 (Lamb, 1925d, p. 117, and Bishop, 1927, p. 202).

***Larus californicus* Lawrence**

California Gull

Common winter visitant along both coasts of the peninsula to its southernmost extremity. First recorded by Belding (1883*b*, p. 549), from San José del Cabo, where found "moderately common" up to May 17. Some other definite stations of occurrence are: Colorado delta, February (Rhoads, 1905, p. 687); San Felipe, March and early April (Huey, 1927*d*, p. 17, and skin in Mus. Vert. Zool. taken March 29, 1926); near Carmen Island, March 13, and La Paz, "common in winter" (Brewster, 1902, p. 20); Magdalena Bay, "in winter" (Bryant, 1889*b*, p. 251); Magdalena Island, November 24 (Cooke, 1915, pp. 41, 42); San Ignacio Lagoon, April 12 (Huey, 1927*g*, p. 240); Todos Santos Islands, March 10 (Kaeding, 1905, p. 107); Ensenada, April 6 (Dwight, 1925, p. 200); Los Coronados Islands, April 6 (Osburn, 1909, p. 136).

***Larus delawarensis* Ord**

Ring-billed Gull

Fairly common winter visitant along both seacoasts of the peninsula. First recorded, from the Cape district, by Belding (1883*b*, p. 545). Definite stations of occurrence are: San Felipe, March and early April (Huey, 1927*d*, p. 17, and skin in Mus. Vert. Zool. obtained March 25, 1926); La Paz, February 15 (Brewster, 1902, p. 21); San Quintín Bay, "in winter" (Bryant, 1889*b*, p. 251); San Quintín, December 27 to January 21 (Cooke, 1915, p. 44); Natividad Island (Lamb, 1927*a*, p. 68).

***Larus heermanni* Cassin**

Heermann Gull

Common resident of the seacoast waters on both sides the whole length of the peninsula, but not breeding, so far as known, on the Pacific side north of about latitude 27°. Nesting colonies in the Gulf extend south from Raza Island (Streets, 1877, p. 26, and many other writers) to Monserrate Island (Brewster, 1902, p. 6), including also: Salsipuedes Island (Mailliard, 1923, p. 451), Ildefonso Island (Thayer, 1909*d*, p. 101, 1911*b*, p. 104, *et al.*), and near Carmen Island (Brewster, *loc. cit.*). The only breeding ground definitely reported from the Pacific side is San Roque Island (Anthony, 1925, p. 281, and Huey, 1927*f*, p. 205). While Heermann (1859, p. 74) thought that this gull bred on Los Coronados Islands, on the Pacific side, there has been no evidence to this effect since his day, though the species (non-breeders) has been recorded during spring and summer from the vicinity of those and many other of the islands fringing the western side of the peninsula. Neither is there confirmation of the report of breeding at Magdalena Bay (Ridgway, 1919, p. 655). While birds are observed commonly enough in the head of the Gulf, as at San Felipe (Huey, 1927*d*, p. 17) and Consag Rock (Townsend, 1890, p. 137), I doubt the correctness of Rhoads' (1905, p. 687) statement that he saw this species as far up the Colorado River as Yuma; for this gull is notably adherent to salt water. First ascribed to Lower California by Baird (1859, p. 306, under the name *Blasippus heermanni*) on the basis of the Xantus collections from Cape San Lucas. Specimens of this gull are in the Museum of Vertebrate Zoology bearing the following data: San Martín Island, July 14 and 16, 1925; San Felipe, on the Gulf, March 27 and April 6, 1926.

***Larus atricilla* Linnaeus**

Laughing Gull

Rare transient. Only one record (Brewster, 1902, p. 22), of a bird taken by Frazar at San José del Cabo, September 6, 1887, and of another seen at the same place November 9 following. This record has been quoted under the further name combination, *Chroicocephalus atricilla* (Ridgway, 1919, p. 639).

***Larus philadelphia* (Ord)**

Bonaparte Gull

Fairly common transient or winter visitant south on both coasts the whole length of the peninsula. First recorded by Belding (1883*b*, p. 545), from the Cape district. Other records are: Volcano Lake, Colorado delta, April 25 (Murphy, 1917, p. 81); mouth of Hardy River, February (Stone and Rhoads, 1905, p. 681); San Felipe, April 4 and 19 (Huey, 1927*d*, p. 17); Mulegé, April 4, Carmen Island, April 3, and La Paz, April 18 (Townsend, 1923, p. 5); "upper Gulf," March 27, La Paz, March 14 (Townsend, 1890, p. 137); Magdalena Island, December 5, San Quintín, January 12 (Cooke, 1915, p. 59); San Ignacio Lagoon, April 18 (Huey, 1927*g*, p. 242). The name combination, *Chroicocephalus philadelphia*, has been used in some of the literature for this gull; for example, see Ridgway (1919, p. 646). Specimens are in the Museum of Vertebrate Zoology taken at San Felipe, on the Gulf, April 8 and 9, 1926.

***Xema sabini* (J. Sabine)**

Sabine Gull

Transient along the Pacific side. First positive record (Cooke, 1915, p. 68) is from San Quintín, August 14, 1905, on authority of Nelson and Goldman. Howell (1917, p. 28) reports a specimen taken by H. Wright near Los Coronados Islands, August 20, 1910. What was thought to be this species was seen at a distance off Abreojos Point, July 31, 1922, and off Todos Santos Islands, August 15, the same year (Anthony, 1925, p. 282).

***Gelochelidon nilotica aranea* (Wilson)**

American Gull-billed Tern

Nelson (1921, p. 116) listed the genus *Gelochelidon* as "known from Lower California." This, I am informed by Dr. Nelson (in letter of January 15, 1927), "refers to two specimens formerly in the United States National Museum and probably identified by Professor Baird. These specimens were collected at Cape St. Lucas by John Xantus, September 16, 1859." This is so important an ascription that I asked Dr. C. W. Richmond to look for any further information he might be able to find concerning it. The Museum register contains record of the specimens of data as given above under nos. 16995-96, using the name "*Sterna aranea*." They were also entered on the Museum's "species sheets," by Baird, here under the name "*Sterna anglica*." Dr. Richmond has looked throughout the terns in both the skin series and mounted collection, without finding these birds. They may have been "distributed" to other museums in accordance with an early custom in the National Museum, in which case they should turn up somewhere. At any rate, it is scarcely thinkable that anyone should have mis-identified so conspicuously characterized a species as the Gull-billed Tern. Of course the probabilities are favorable, too, in that a large breeding colony is now known to be established on Salton Sea, directly north of the United States boundary of Lower California.

***Hydroprogne caspia imperator* (Coues)**

Coues Caspian Tern

Apparently resident, sparsely. A breeding colony, the only one known on the peninsula, exists at Scammons Lagoon (Bancroft, 1927a, p. 32). Definitely based occurrences otherwise are as follows: La Paz, November, as taken by Forrer (Saunders, 1896, p. 37, under the name *Hydroprogne caspia*), this being the first record; La Paz, January 25 (Brewster, 1902, p. 23, under *Sterna caspia*); La Paz and San José del Cabo, a few "in winter and spring" (Lamb, 1927b, p. 155); Volcano Lake, in the Colorado delta, April 25 (Murphy, 1917, p. 81); San Felipe, in spring (Huey, 1927d, p. 18); San Ignacio Lagoon, April 12 [not 13] (Bancroft, 1927b, p. 190, using the name *Sterna caspia imperator*); Pond Lagoon (Huey, 1927g, p. 243). Specimens of this tern in the Museum of Vertebrate Zoology were obtained at San Felipe, on the Gulf, March 28 and 29 and April 4, 1926.

***Thalasseus maximus* (Boddaert)**

Royal Tern

Common resident on both coasts of the peninsula to its southern extremity. Two definitely determined breeding places have been reported: Scammons Lagoon and San Roque Island (Bancroft, 1927a, p. 34). Has possibly bred also at San Quintín Bay (Howell, 1911, p. 152, under the name *Sterna maxima*); but I can find no basis for the implication that this tern breeds on Natividad Island (Bent, 1921, p. 218), though the birds occur there commonly enough (Lamb, 1927a, p. 68). Some others of the many localities whence birds have been recorded are: Guadalupe Island (Gaylord, 1897a, p. 42); Cedros Island, and San José del Cabo (Belding, 1883a, p. 532, 1883b, pp. 545, 549, under the name *Thalasseus regius*), these being the first records for Lower California; San Martín Island, and San Juanico Bay (Kaeding, 1905, p. 107); Los Coronados Islands (Howell, 1917, p. 29); San Benito Islands (Anthony, 1900a, p. 28); San José Island, and Ángel de la Guardia Island, in the Gulf (Townsend, 1923, p. 5); Raza and Partida islands [near lat. 28° 50'] (Mailliard, 1923, p. 453); La Paz (Brewster, 1902, p. 24). A specimen in the Museum of Vertebrate Zoology was taken on San Martín Island, July 18, 1925.

***Thalasseus elegans* (Gambel)**

Elegant Tern

Variably common resident along both seacoasts of the peninsula south to the Cape district. Known breeding colonies in the Gulf are located as follows: Raza Island (Mailliard, 1923, pp. 445, 448, Field, 1925, pp. 158, 161, and other authors); Cerralvo Island (Thayer, 1911c, p. 171). The only definitely known breeding grounds on the Pacific side are Scammons Lagoon and San Roque Island (Bancroft, 1927a, p. 36, and Anthony, 1925, p. 282, under the name *Sterna elegans*). The species was first recorded by Bryant (1889b, p. 252), from Magdalena Bay. Other record stations are: La Paz to Ángel de la Guardia Island (Townsend, 1890, p. 137, and 1923, p. 6); delta of Colorado River (Rhoads, 1905, p. 687), "seen" [but doubtful]; San Felipe Bay (Huey, 1927d, p. 18); Abreojos Point, and San Quintín (Anthony, *loc. cit.*); Santo Domingo Point [near lat. 26° 20'] (Kaeding, 1905, p. 107). The Museum of Vertebrate Zoology contains a series of specimens taken at San Felipe, on the Gulf, March 24 to April 2, 1926.

***Sterna forsteri* Nuttall**

Forster Tern

Winter visitant and transient, probably fairly regular and common though records are few. First ascribed to Lower California by Belding (1883*b*, p. 546) who met with it in the Cape district, dates not specified. Definite records are: Mouth of Colorado River near Montague Island, mid-winter (Price, 1899, p. 90); San Felipe, April 7, 1926 (skin in Mus. Vert. Zool.); La Paz, January (Saunders, 1896, p. 48); San José del Cabo, September 29 and 30 (Brewster, 1902, p. 25); San José del Cabo and La Paz Bay, "common during the winter" (Lamb, 1927*b*, p. 155); Abreojos Point, July 31, and San Quintín Bay, August 14 (Anthony, 1925, p. 283); Los Coronados Islands, August 6 (Grinnell and Daggett, 1903, p. 32) and in "early part of July" (Howell, 1917, p. 29).

***Sterna hirundo* Linnaeus**

Common Tern

Transient, likely regularly so along the Pacific seacoast, and apparently wintering in the Cape district. Only three definite records: "coast of Lower California" (A. O. U. Comm., 1895*b*, p. 24); San José del Cabo, six specimens taken by Frazar, September 5 to 30, 1887 (Brewster, 1902, p. 25); about La Paz and Espíritu Santo Island, "seen commonly during the winter" [of 1923-24], and specimen from latter locality, November 29 (Lamb, 1927*b*, p. 155).

***Sterna antillarum browni* Mearns**

California Least Tern

Breeds in small numbers at Scammons Lagoon (Bancroft, 1927*a*, p. 39), and at San José del Cabo (Lamb, 1927*b*, p. 155). Otherwise known only as a sparse transient, with definite records as follows: Abreojos Point, July 31 (Anthony, 1925, p. 283, under the name *Sterna antillarum*); San Ignacio Lagoon, April 13 (Bancroft, 1927*b*, p. 190); Pond Lagoon, April 14 (Huey, 1927*g*, p. 243); San José del Cabo, September 6 to 12 (Brewster, 1902, p. 26), this latter being the first ascription of the species to Lower California. The record from the Colorado delta, February [?] (Rhoads, 1905, p. 687), is doubtful.

***Sterna fuscata crissalis* (Lawrence)**

Socorro Sooty Tern

Occurs sparingly far offshore southerly, with records as follows: Seen July 20, 1905, in lat. 25° 56', long. 114° 11', which is off Abreojos Point (Gifford, 1913, p. 20, under the name *Sterna fuliginosa*); nine specimens taken April 24, 1925, at Alijos Rocks, about lat. 25°, long. 116° (McLellan, 1926, p. 283, under the name *Sterna fuscata*); these birds are now nos. 28031-39, Calif. Acad. Sci. (*vide* H. S. Swarth). Coues (1903, p. 1016) records this species from "coast of Mexico up to the Gulf of California," but upon what detailed basis I do not know.

***Chlidonias nigra surinamensis* (Gmelin)**

American Black Tern

Transient, probably regular and common at least in the fall, along the Pacific side of the peninsula. First recorded by Brewster (1902, p. 26, under the name *Hydrochelidon nigra surinamensis*) from specimens taken by Frazar at San José del Cabo, September 6 and 17, 1887. Further records are: Cape San Lucas,

September 16 (Bent, 1921, p. 299); Todos Santos, latitude 23° 27', September 8 (Lamb, 1927b, p. 155); Abreojos Point, July 31, and "kelp beds 100 miles north," "a day or two later" (Anthony, 1925, p. 283).

Diomedea nigripes Audubon

Black-footed Albatross

Formerly common at all seasons on the open ocean south regularly to about latitude 25°, but now scarce (Anthony, 1924, p. 34). First recorded from Lower Californian waters by Bryant (1889b, p. 252) who "caught four with hook and line when sailing from Guadalupe Island to Ensenada" [in April, 1886]. Other definite records are: near Guadalupe Island, three seen September 17, 1896 (Gaylord, 1897a, p. 42), seven taken June 27 and 28, 1906 (Thayer and Bangs, 1908, p. 103), and two seen July 11, 1922 (Anthony, 1925, p. 283); common in 1897 "all summer from San Diego [California] south to Cape San Lázaro, both far out at sea and along the coast line" (Kaeding, 1905, p. 107); going south, last seen "just before we past Cape St. Lucas" April 2, 1909 (Lamb, 1910, p. 74); 20 miles off San Quintín, July 24, 1910 (Howell, 1911, p. 151); one seen at sea north of Magdalena Bay, May 31, 1925 (McLellan, 1926, p. 285); San Quintín Bay [no date] (Bent, 1922, p. 5, under the name *Phoebastria nigripes*). No record from the Gulf.

Diomedea albatrus Pallas

Short-tailed Albatross

Formerly fairly common on the open ocean south to about latitude 25°, but not seen of recent years (Anthony, 1924, p. 34). First recorded by Bryant (1889b, p. 252) who states that, in April, 1886, five birds followed his boat between Guadalupe Island and Ensenada, and that, in April, 1888, he saw one "on the water of the *estero*," Magdalena Bay. Anthony (1925, p. 283) says that this albatross formerly occurred regularly on the waters around Los Coronados Islands. The species has been cited from Lower California also under the name *Phoebastria albatrus* (Bent, 1922, p. 9).

Diomedea immutabilis Rothschild

Laysan Albatross

Visitant formerly in small numbers on the open ocean, but not observed of late years. First recorded by Anthony (1898b, p. 38), on the basis of one shot March "17" [=19], 1897, between San Gerónimo and Guadalupe islands. This specimen is now no. 21880 in the collection of the Carnegie Museum, so I am informed by Mr. W. E. C. Todd, who has verified its identity and the date of capture, as above. Anthony (1924, p. 34) further states that from 1887 to 1897 he is now sure of having seen several of this species within 40 miles of San Gerónimo Island. Kaeding (1905, p. 107) records what was probably the same bird as originally recorded by Anthony, as "taken between Guadalupe and San Martín islands on March 19th," 1897. This albatross has been credited to Lower California also under the name *Phoebastria immutabilis* (Bent, 1922, p. 16).

Fulmarus glacialis rogersii Cassin

Pacific Fulmar

Varyingly common in winter on the ocean along the Pacific side of the peninsula northerly (Anthony, 1925, p. 284, under the name *Fulmarus glacialis*).

Recorded first by Anthony (1895*b*, pp. 100, 107, under *Fulmarus glacialis glupischa*), from near San Martín Island; and subsequently by Willett (1913, p. 20) from San Gerónimo Island, by Stephens (1921, p. 96) from Los Coronados Islands, and by Anthony (1925, p. 284) from Cedros Island [a skull on the beach]. C. H. Townsend (MS) took two specimens, October 28, 1884, at sea off Magdalena Bay; and this probably constitutes the first capture of the species in Lower Californian waters. At any rate it marks the southernmost known station for the species.

***Puffinus creatopus* Coues**

Pink-footed Shearwater

Apparently of numerous though irregular occurrence in the summer season on the open ocean. First definitely recorded by Gaylord (1897*a*, p. 42), as seen by A. W. Anthony near Guadalupe Island, September 17, 1896. Reported by Kaeding (1905, p. 107) as "common off San Domingo Point [near lat. 26° 20'] on June 14th," 1897. Howell (1917, p. 31) records the species as present around Los Coronados Islands during June and July and on August 13 [1914]. Anthony (1925, p. 284) makes a general statement concerning this shearwater as observed by him in the summer of 1922 along the west side of the peninsula as follows: "This species was found more or less abundant all along the coast and for 50 miles or more at sea."

***Puffinus auricularis* C. H. Townsend**

Townsend Shearwater

Reported only from the ocean in the vicinity of Cape San Lucas, whence recorded by Anthony (1898*b*, p. 38) as "fairly common April 23 [1897], and again in early June [of that year]." (See also Anthony, 1900*d*, p. 249, and Kaeding, 1905, p. 108.)

***Puffinus opisthomelas* Coues**

Black-vented Shearwater

Abundant resident on the open ocean along the Pacific side of the peninsula. First recorded, and originally named, by Coues (1864, p. 139), on the basis of specimens [type, taken July 20, 1859, now no. 16990, U. S. Nat. Mus.] obtained by John Xantus at Cape San Lucas. The main nesting colony is located on Natividad Island (Anthony, 1900*d*, p. 248, and many other writers). Other definitely known nesting places are: Guadalupe Island (Anthony, 1896*b*, p. 224, *et al.*); and San Benito Islands (Anthony, 1900*a*, p. 29, under the name *Puffinus gavia*, *et al.*). The supposition (Howell, 1910, p. 186) that this species nests on Los Coronados Islands and San Martín Island has not been confirmed. The records of the birds as seen at sea northwest from Cape San Lucas are too numerous to cite. There is a record of shearwaters, probably this species, seen in numbers in the Gulf between Carmen and Monserrate islands, and near Espíritu Santo Island, in March (Brewster, 1902, p. 26); and there is some evidence warranting belief that the present species has nested on Raza Island (Baneroff, 1927*b*, p. 190).

***Puffinus griseus* (Gmelin)**

Dark-bodied Shearwater

Common during the spring and summer months on the ocean along the western side of the peninsula; however, not known to breed anywhere in this portion of the Pacific. First recorded by Coues, from Cape San Lucas, on the basis of a specimen taken by Xantus, August 18, 1860, which specimen was made the type

[now no. 47214, U. S. Nat. Mus.] of a supposedly new species, *Nectris amaurosoma* Coues (1864, p. 124); later, *Puffinus amaurosoma* (Coues, 1872, p. 332). But this name subsequently fell into the synonymy of *Puffinus griseus*. Some other stations of recorded occurrence northwest from the Cape are: off San Domingo Point [near lat. 26° 20'], and off Natividad Island (Kaeding, 1905, p. 108); near Guadalupe Island (Thayer and Bangs, 1908, p. 103); near Todos Santos Islands (Howell, 1912, p. 188); and all along the coast (Anthony, 1925, p. 285, Willett, 1913, p. 20). Sometimes also enters the Gulf, clear to its head, as numerous dried remains were found on the beach at San Felipe in March and April, 1926 (Huey, 1927*d*, p. 18, and skull in Mus. Vert. Zool.).

***Puffinus cuneatus* Salvin**

Wedge-tailed Shearwater

Known only from the ocean in the neighborhood of Cape San Lucas, whence reported by Anthony (1898*b*, p. 39) as observed on April 23 [1897] and again in early June. Kaeding (1905, p. 108), who accompanied Anthony, gives June 5 [1897] as a definite date of seeing this species near Cape San Lucas.

***Halocryptena microsoma* Coues**

Least Petrel

Fairly common in summer on the waters adjoining the peninsula on both its coasts. Recorded on the west side as breeding only on the San Benito Islands (Anthony, 1896*c*, p. 16, and subsequent writers); otherwise recorded at sea as follows: near Cape San Lucas (Lamb, 1910, p. 74); near Magdalena Bay (Anthony, 1925, p. 285); off San Domingo Point [near lat. 26° 20'] (Kaeding, 1905, p. 108); near San Gerónimo Island (Gaylord, 1897*a*, p. 41). Recorded in the Gulf as breeding on Partida Island [near lat. 28° 50'] (Mailliard, 1923, p. 445), and on Consag Rock [off San Felipe] and the San Luis Islands [lat. 30°] (Bancroft, 1927*b*, p. 191). First recorded from Lower California, and newly named, by Coues (1864, p. 79); type [now no. 47216, U. S. Nat. Mus.] taken by John Xantus in May, 1861, at San José del Cabo. The Museum of Vertebrate Zoology contains two specimens taken by (or for) A. W. Anthony on the San Benito Islands, July 27, 1896.

***Oceanodroma leucorhoa kaedingi* Anthony**

Kaeding Leach Petrel

Apparently fairly common in summer off the northwestern seacoast of the peninsula. First recorded, and newly described, by Anthony (1898*a*, p. 37, under the name *Oceanodroma kaedingi*); type [now no. 22219 in Carnegie Mus.] taken by himself, July 25, 1897, at sea near Guadalupe Island (see also Anthony, 1898*c*, p. 143). Other records are: south from Guadalupe Island, far offshore (Kaeding, 1905, p. 108); vicinity of Guadalupe Island (Townsend, 1923, p. 6, McLellan, 1926, p. 286); Guadalupe Island, breeding, and seen at sea as far south as Ballenas Bay [lat. 26° 40'] (Anthony, 1925, p. 286). Guadalupe Island is thus the only known breeding station for this petrel.

***Oceanodroma socorroensis* C. H. Townsend**

Socorro Petrel

Common in summer on the ocean off the western side of the peninsula. Two breeding places are known: Los Coronados Islands (Anthony, 1898*c*, p. 140, and

many subsequent writers), and San Benito Islands (Anthony, 1896c, p. 16 [first record of the species from Lower California], *et al.*). Besides at sea in the vicinity of the breeding grounds, birds have been reported definitely only from Ballenas Bay (Anthony, 1925, p. 288, under the name *Oceanodroma monorhis*).

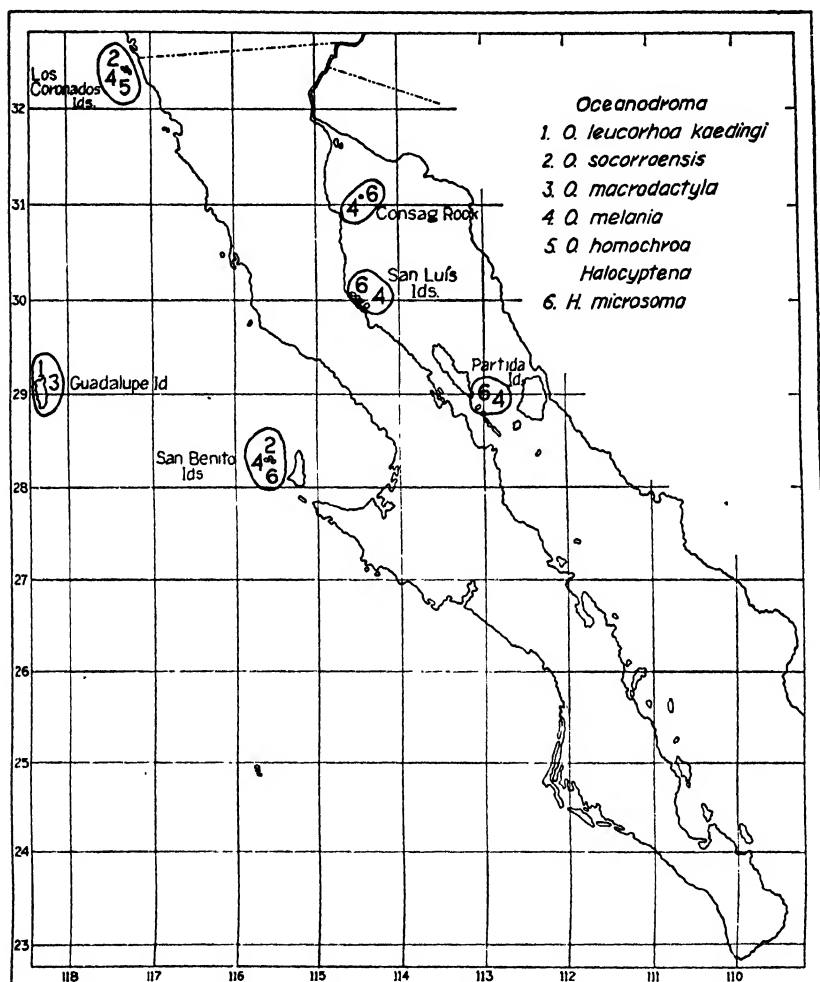


Fig. 3. Breeding places of Petrels, genera *Oceanodroma* and *Halocyptena*, in Lower California.

So far as known, published ascriptions of this species to the Gulf are erroneous (see Brewster, 1903, p. 63). For a full account of nesting, see Bent (1922, p. 162, under *Oceanodroma monorhis socorroensis*). Variability in one feature, namely, in the presence and amount of white on the upper tail coverts, has led to a vast amount of speculation in regard to the status of this petrel (for example, see Godman, 1907, pp. 32-35, under *Oceanodroma monorhis*). A resulting synonym is *Oceanodroma monorhis chapmani* Berlepsch (1906, p. 185), with type [in Berlepsch coll.] from San Benito Islands, taken [doubtless by or for A. W. Anthony]

July 14, 1897. The Museum of Vertebrate Zoology contains a series of this petrel taken on Los Coronados Islands, August 6, 1902 (see Grinnell and Daggett, 1903, p. 31), August 19, 1910, June 17 and 19, 1913, and August 13, 1914 (see van Rossem, 1915, p. 76).

***Oceanodroma macrodactyla* W. E. Bryant**

Guadalupe Petrel

Known only from Guadalupe Island and the nearby ocean, whence recorded first by Bryant (1887*a*, p. 276, under the name *Oceanodroma leucorhoa*). Described as new by Bryant (1887*b*, p. 450) under the name *Oceanodroma leucorhoa macrodactyla*, with types taken by himself from nesting burrows on Guadalupe Island. These two types, male and female, collected March 4, 1886, were originally numbered 2567 and 2565, respectively. Interestingly enough, they were the only birds, so far as known, saved from the collection of the California Academy of Sciences during the fire of 1906; and they became nos. 1 and 2 of the Academy's new collection of birds [*vide* H. S. Swarth]. This petrel is very scarce at the present time, even if not approaching close to extinction (Anthony, 1925, p. 286). For general account, see Bent (1922, p. 151). Some other citations of importance are: Gaylord (1897*a*, p. 41); Anthony (1898*c*, p. 141); Thoburn (1899, p. 278); Kaeding (1905, p. 108); Thayer and Bangs (1908, p. 103); Townsend (1923, p. 6). Two specimens are contained in the Museum of Vertebrate Zoology [received from Carnegie Mus.] taken by [or for] A. W. Anthony, March 24, 1897.

***Oceanodroma melania* (Bonaparte)**

Black Petrel

Common resident of the near-shore waters along both sides of the peninsula. First recorded by Baird (1859, pp. 301, 306, under the name *Thalassidroma melania*) as taken by Xantus at Cape San Lucas; see also Coues (1864, p. 77, under the name *Cymochorea melania*). Gulf stations of known occurrence are: Consag Rock, off San Felipe, breeding (Bancroft, 1927*b*, p. 190); one of the San Luis Islands, breeding (van Rossem, MS); Partida Island, near lat. 28° 50', breeding (Mailliard, 1923, pp. 445, 454); San Francisquito Bay (Townsend, 1923, p. 6). Cape district and Pacific-side stations are: San José del Cabo (Townsend, *loc. cit.*); northwest of Cape San Lucas (Lamb, 1910, p. 74); San Benito Islands, breeding (Anthony, 1896*c*, p. 16, and many other authors); near San Gerónimo Island (Gaylord, 1897*a*, p. 41); off San Domingo Point [near lat. 26° 20'], and near Guadalupe Island (Kaeding, 1905, p. 108); Los Coronados Islands, breeding (Anthony, 1898*c*, p. 141, and many subsequent writers). A synonym for this species is *Oceanodroma townsendi* Ridgway (1893, p. 687), with type [no. 13025 in U. S. Nat. Mus.] from Cape San Lucas, taken by J. Xantus, June 1, 1859. Specimens of this petrel are in the Museum of Vertebrate Zoology from Los Coronados Islands, taken August 6, 1902 (see Grinnell and Daggett, 1903, p. 30).

***Oceanodroma homochroa* (Coues)**

Ashy Petrel

Rare off the northwestern coast of the peninsula. But three records: A wing found on Guadalupe Island, September 18, 1896 (Gaylord, 1897*a*, p. 42); one specimen taken off San Benito Islands, April 23, 1911 (Townsend, 1923, p. 6); a bird taken with an egg on one of Los Coronados Islands, April 20, 1916 (Huey, 1925*a*, p. 72).

Phaëthon aethereus Linnaeus

Red-billed Tropic-bird

Fairly common resident in the Gulf and on the waters around the Cape district. Occurs only stragglingly far up the Pacific side of the peninsula. First recorded by Belding (1883*b*, p. 545) on the basis of a specimen taken at Espíritu Santo Island, February 1, 1882. Other Gulf occurrences are: Consag Rock, off San Felipe, April (Bancroft, 1927*b*, p. 191); San Luis Island [lat. 30°], April (van Rossem, MS); San Pedro Mártir Island [Sonoran side of the Gulf], breeding (Goss, 1888, p. 244, and other writers); Monserrate Island, March 4 (Brewster, 1902, p. 34). Recorded from Cape San Lucas, as well as the Gulf, by Baird, Brewer and Ridgway (1884, pp. 185, 190), and up the west side of the peninsula as follows: in vicinity of Cedros Island in June, off Cape Colnett in September, and about Todos Santos Islands (Anthony, 1889*c*, p. 86), but with some doubt as to species (see Anthony, 1924, p. 34); in or near Magdalena Bay in January and June (Bryant, 1889*b*, p. 253, Kaeding, 1905, p. 109); west of San Martín Island, July (Gifford, 1913, p. 106); Los Alijos Rocks, about lat. 25°, long. 116°, April 24, possibly breeding (McLellan, 1926, p. 287).

Phaëthon rubricaudus rothschildi Mathews

Laysan Red-tailed Tropic-bird

Rare visitant to the ocean off the northwestern coast of the peninsula. Definitely recorded only by Anthony (1898*b*, p. 38, under the name *Phaëthon rubricaudus*) on the basis of a specimen shot close to Guadalupe Island, July 23, 1897. I learn through Mr. W. E. C. Todd (letter of January 12, 1927) that this specimen, the identity of which he has verified for me, is now no. 21822, Carnegie Museum. Later (1924, p. 34), Anthony indicates the likelihood that some of the Tropic-birds he occasionally saw in former years north from Cedros Island were of this species. Under the name *Scæophæthon rubricaudus rothschildi* [*sic*], Oberholser (1919*j*, p. 557) cites Anthony's record, but gives the date of capture wrongly, as "April." Bent (1922, p. 193, under *Scæophaëthon rubricaudus*) makes the same mistake.

Sula dactylatra californica Rothschild

Pacific Blue-faced Booby

Recorded only recently from Los Alijos Rocks, about lat. 25°, long. 116°, where a bird was taken April 24, 1925, and the species was thought to be breeding (McLellan, 1926, pp. 287-88, under the name *Sula dactylatra*). This specimen, collected by Frank Tose, is no. 28070, Calif. Acad. Sci. (*fdæ* H. S. Swarth). Even though this subspecies was named "*californica*," there was, at the time of its description (from islands off the west coast of Mexico), no good record from either upper California or Lower California (see Oberholser, 1917*b*, p. 467).

Sula nebouxi Milne-Edwards

Blue-footed Booby

Common resident locally in the Gulf of California. Named as a supposed new species, *Sula gossi* "Ridgw. (MS)," by Goss (1888, p. 241) from San Pedro Mártir Island [Sonoran side of the Gulf], where found breeding. Subsequently reported by other explorers as breeding on that island, and also on one other island, Ildefonso (Thayer, 1909*d*, p. 101, 1911*b*, p. 106, Mailliard, 1923, p. 452,

and Lamb, 1924, p. 63). Thayer's record is thus the first for Lower California in the properly restricted sense. Seen also, in April, at Consag Rock, off San Felipe (van Rossem, MS). Observed once at La Paz, March 1, 1924 (Lamb, 1927b, p. 155). There is one record of this Booby for the west side of the peninsula: A specimen obtained at the San Benito Islands, July 15, 1905 (Gifford, 1913, p. 93); this bird is no. 2541, Calif. Acad. Sci. (*vide* H. S. Swarth).

***Sula brewsteri* Goss**

Brewster Booby

Common resident in the Gulf. Recorded first by Belding (1883c, p. 352, under the name *Sula leucogastra*), from near Pichilingue Bay, near La Paz, January. Goss (1888, p. 242) describes the species as new from San Pedro Mártir Island [Sonoran side of the Gulf], where found breeding by him as well as by subsequent writers. Other stations of known occurrence are: Ildefonso Island, breeding (Thayer, 1909d, p. 101, 1911b, p. 106); San José Island (Townsend, 1923, p. 6; La Paz Bay in March, and about Espíritu Santo Island in November (Lamb, 1927b, p. 156); Consag Rock, off San Felipe, and one of the San Luís Islands [lat. 30°], breeding (Bancroft, 1927b, p. 192); San José del Cabo, September 10 (Brewster, 1902, p. 35); off East San Benito Island, August 7 (Huey, 1924a, p. 74). The latter is the only record to date from the west side of the peninsula. Another name which has been used in recording this Booby from Lower California is: *Sula sula* (Bryant, 1889b, p. 253).

***Phalacrocorax auritus albocillatus* Ridgway**

Farallon Double-crested Cormorant

Resident abundantly along the whole western side of the peninsula, and in lesser numbers locally in the Gulf and thence up into the delta of the Colorado River. There are at least 35 records of this cormorant for Lower California, the earliest one of which is by Baird (1859, pp. 301, 306, under the name *Graculus dilophus*) of capture by Xantus at Cape San Lucas. Then Salvadori (1865, p. 388, using the name *Graculus mexicanus*) reported it as breeding on Natividad Island; and numerous subsequent writers have reported it as nesting on practically all the other Pacific-side islands, except Guadalupe, north of, and from, Santa Margarita Island (Bryant, 1889b, p. 254, under *Phalacrocorax dilophus albocillatus*). There is one, rather casual, record of the species from Guadalupe Island (Huey, 1924b, p. 586). Belding (1883b, pp. 545, 548, under *Phalacrocorax dilophus cinninatus*) records this cormorant as common in winter at La Paz. Breeding colonies exist in the Gulf near San José Island (Brewster, 1902, p. 36), on Ildefonso Island (Lamb, 1924, p. 63), and on one of the San Luís Islands [lat. 30°] (Bancroft, 1927b, p. 193). The birds are abundant in the delta of the Colorado River, at least during winter and spring (Murphy, 1917, p. 82). Stragglers turn up almost anywhere; for example, the Museum of Vertebrate Zoology contains a specimen taken at La Grulla, 7200 feet altitude, on the Sierra San Pedro Mártir, May 12, 1926.

***Phalacrocorax penicillatus* (Brandt)**

Brandt Cormorant

Abundant resident along the Pacific side of the peninsula, south to the Cape. First recorded by Belding (1883a, p. 528, 1883b, pp. 545, 548) from Los Coronados and Cedros islands, and from San José del Cabo where "abundant" in

spring. Some others of the many recorded stations of occurrence are: Magdalena Bay (Bryant, 1889*b*, p. 257); San Roque and Asunción islands, breeding (Anthony, 1925, p. 289); San Gerónimo Island, nesting abundantly (Gaylord, 1897*c*, p. 102); Todos Santos Islands, nesting (Van Denburgh, 1924, p. 69); Guadalupe Island, small colony nesting (McLellan, 1926, p. 290); etc. There is only one positive record of this species for Gulf waters: La Paz in January (Brewster, 1902, p. 37). The record for the Colorado delta, in December (Price, 1899, p. 90) is probably an error, as is, I think, also that for the inland localities, Valladares and San Telmo (Anthony, 1893, p. 230).

***Phalacrocorax pelagicus resplendens* Audubon**

Baird Pelagic Cormorant

Rather uncommon resident along the northwestern seacoast of the peninsula. The first record for Lower California (Baird, Brewer and Ridgway, 1884, II, p. 160) was from "Cape St. Lucas"; but this record was probably faulty since Brewster (1902, p. 37) was unable to find any definite basis for it. Bryant (1889*b*, p. 257) recorded the species next as seen by Anthony in May near the Todos Santos Islands. Kaeding (1905, p. 109) records "a few individuals" as seen in March on San Gerónimo Island. Baneroff (1927*b*, p. 193) reports the species from "Chester Rock," near the mouth of Scammon Lagoon. Anthony (1906*a*, p. 137) reports it as found at both San Gerónimo and Natividad islands, though "somewhat rare"; the latter is apparently the southernmost authentic station of occurrence. Willett (1913, p. 21) found it at Cape Colnett, April 7. It is more regular of occurrence, and known to breed, at the extreme north, on Los Coronados Islands (Osburn, 1909, p. 137, Howell, 1917, p. 39, and other writers). Reference to this cormorant in Lower California has been made also under the name *Phalacrocorax pelagicus* (Salvin and Godman, 1901, p. 152).

***Pelecanus erythrorhynchos* Gmelin**

American White Pelican

Abundant winter visitant to the delta region of the Colorado River; also small numbers at that season visit other parts of the peninsula sporadically, reaching even the Cape district. First recorded by Ridgway (*in* Belding, 1883*b*, p. 534) as found by Xantus at San José del Cabo in January and February, and at Cape San Lucas. Brewster (1902, p. 38) also reports it from San José del Cabo, in November. Belding (1883*c*, p. 352) saw it at La Paz in February. Bryant (1889*b*, p. 257) heard of its occurrence on the Pacific coast of the peninsula about 100 miles north of Magdalena. A small flock was reported by Kaeding (1905, p. 109) as seen on San Gerónimo Island in March. Huey (1927*d*, p. 19) observed the species at San Felipe, on the Gulf, in March and early April. Records from the Colorado delta are several, beginning with Price (1899, p. 90), who saw an "immense gathering" there in December. The Museum of Vertebrate Zoology contains a specimen taken on the Colorado River twenty miles south of Pilot Knob, October 21, 1927.

***Pelecanus occidentalis californicus* Ridgway**

California Brown Pelican

Abundant resident along the whole Pacific seacoast of the peninsula. Resident also on the east side, clear to the head of the Gulf, but in smaller numbers. First recorded by Belding (1883*b*, pp. 545, 548, under the name *Pelecanus fuscus*),

from Cape San Lucas and San José del Cabo. *Pelecanus californicus* originally named by Ridgway (in Baird, Brewer and Ridgway, 1884, II, pp. 132, 143), with type [no. 86384 in U. S. Nat. Mus.] from La Paz, taken by L. Belding, February 24, 1882. Some west-side breeding places are: Los Coronados Islands (Bryant, 1889b, p. 259, on authority of A. M. Ingersoll, and many subsequent writers); Todos Santos and San Martín islands (Anthony, 1889b, p. 83, *et al.*); San Roque and Asunción islands (Anthony, 1925, p. 290); Santa Margarita Island (Bryant, *loc. cit.*, *et al.*). Not often noted over deep water; there is one record of a straggler at Guadalupe Island (Anthony, *loc. cit.*). Gulf-side breeding places are Ildefonso Island (Lamb, 1924, p. 63), and San Luis, Granite, and Salsipuedes islands [between lats. 28° and 30°] (Mailliard, 1923, pp. 450, 451). Some other stations of record in the Gulf are: Mulegé (Ogilvie-Grant, 1898, p. 479), Ceralvo, Raza and Partida islands (Mailliard, 1923, p. 454), Consag Rock, off San Felipe (van Rossem, MS), and San Felipe Bay (Huey, 1927d, p. 19). A specimen in the Museum of Vertebrate Zoology was taken on one of the Todos Santos Islands, January 16, 1927.

***Fregata magnificens* Mathews**

Galápagos Man-o-war-bird

Common resident of the more southerly waters. On the Pacific side breeds abundantly at Santa Margarita Island (Bryant, 1889b, p. 260, and 1893, p. 1, and subsequent writers, under the name *Fregata aquila*); but only stragglers (if of this species of man-o'-war-bird) occur to the north of about latitude 26°: "occasional" north to San Diego [upper California] (Kaeding, 1905, p. 110); between Guadalupe Island and Los Alijos Rocks, April 23 (McLellan, 1926, p. 291); San Ignacio Lagoon in winter, "not uncommon" (Huey, 1927g, p. 242, under the name *Fregata minor palmerstoni*). In the Gulf, has been reported from: La Paz (Ogilvie-Grant, 1898, p. 447, and Brewster, 1902, p. 40); San Francisco Island (Mailliard, 1923, p. 454); Concepción Bay (Townsend, 1923, p. 8); San Pedro Mártir Island [Sonora] (Bryant, 1889b, p. 265); San Luis Islands [lat. 30°], March and April (Bancroft, 1927b, p. 193). First reported from Lower California by Belding (1883b, pp. 545, 548, under the name *Tachypterus aquila*), from the Cape region, "abundant," including San José del Cabo. Specimens in the U. S. National Museum from La Paz and San José del Cabo, identified at my request by Dr. C. W. Richmond, prove to be definitely of the species *magnificens*. Bent (1922, p. 314) uses the name *Fregata magnificens rothschildi* for the birds breeding "as far north as Santa Margarita Island."

***Fregata minor palmerstoni* (Gmelin)**

North Pacific Man-o'-war-bird

Believed to occur more or less regularly as a vagrant on the ocean along the western side of the peninsula. Oberholser (1917b, p. 469) says positively that "birds [examined by him] from the coasts of California and Lower California belong clearly to this race"; but he does not give references or other data. It is assumable that some of the references I give under *magnificens*, of "stragglers," may really pertain to the present form. Specimens are not available to me for determination.

***Mergus serrator* Linnaeus**

Red-breasted Merganser

Apparently a fairly common winter visitant south along both coasts clear to the Cape district. First recorded by Belding (1883c, p. 352) as "common at La Paz in winter." Further definite records are: Colorado delta, "many" in

February (Rhoads, 1905, p. 688, under the name *Merganser serrator*); San Felipe, "latter part of April" (Huey, 1927*d*, p. 19); Mulegé, April 4 (Townsend, 1923, p. 9); Magdalena Bay in March and April, and San Quintín Bay in May (Bryant, 1889*b*, p. 265); San Gerónimo Island, April 14, and Cedros Island, April 17 (Willett, 1913, p. 21); San Ignacio Lagoon, April 12 (Huey, 1927*g*, p. 240); Pond Lagoon, April 13 to 17 (Huey, 1927*g*, p. 243); west coast, northerly, in general (Kaeding, 1905, p. 110). A specimen in the Museum of Vertebrate Zoology was obtained at San Ramón, mouth of Santo Domingo River, December 8, 1925.

***Lophodytes cucullatus* (Linnaeus)**

Hooded Merganser

Rare winter visitant south to the Cape district. First recorded by Ridgway (*in* Belding, 1883*b*, p. 534) as taken by Xantus at San José del Cabo in February. Belding (1883*c*, p. 352) also found it in the Cape district but considered it "rare." Bryant (1889*b*, p. 265) says, more specifically, that Belding had found it at La Paz. Dr. Richmond informs me that there is, in the United States National Museum, a female skin (no. 31940) taken by Xantus at San José "Mission," February, 1860; this is the only specimen actually preserved that I know of, from Lower California.

***Anas platyrhynchos platyrhynchos* Linnaeus**

Common Mallard

More or less common winter visitant, at least formerly, south to the extremity of the peninsula, and resident toward its base. First recorded by Ridgway (*in* Belding, 1883*b*, p. 534, under the name *Anas boschas*) as taken by Xantus at San José del Cabo in December. Belding (1883*c*, p. 352) indicates that he shot it at several localities in the Cape region. Townsend (1923, p. 8) found it at San Josef [San José] Island in March. Price (1899, p. 90) and others have found it numerous in winter or spring in the Colorado delta. Anthony (1893, p. 230) found mallards nesting in May, 1893, on La Grulla meadows, Sierra San Pedro Mártir (see also Nelson, 1921, p. 21); a skin is in the Museum of Vertebrate Zoology, taken by W. D. Strong at the same place May 29, 1925. Bryant (1889*b*, p. 265) states that Belding had found the species breeding in San Rafael Valley, 25 miles east of Ensenada. Huey (1928*a*, p. 159) has found it breeding at Laguna Hanson.

***Chaulelasmus streperus* (Linnaeus)**

Gadwall

Common winter visitant to brackish or fresh-water lagoons south throughout the peninsula wherever such occur. First recorded by Ridgway (*in* Belding, 1883*b*, p. 534) as taken by Xantus at San José del Cabo in December and February. Townsend (1923, p. 8) reports it from the same place. Belding (1883*c*, p. 351) found the species "very common" south from La Paz. Bryant (1889*b*, p. 265, under the name *Anas strepera*) states that Belding "saw several pairs" in San Rafael Valley, 25 miles east of Ensenada, in spring. By mistake, corrected by himself shortly afterward, Willett (1913, pp. 21, 184) recorded this duck from Colnett. But despite the correction, made clearly enough, this record continues to be cited in general accounts of the species! Specimens of the Gadwall are in the Museum of Vertebrate Zoology from San Telmo, December 4, 1925, from San Ramón, December 10, 1925, and from ten miles east of Cerro Prieto, in the Colorado delta, February 18 and 26, 1928.

***Mareca americana* (Gmelin)**

Baldpate

Common winter visitant in suitable spots south throughout the peninsula. First recorded by Belding (1883*b*, p. 548) from San José del Cabo, up to May 17. Brewster (1902, p. 43) records the species from the same place as common in the autumn, and also from Triunfo, April 1, and from near San José Island, March 6. Bent (1923, p. 97) records it from La Paz and Colnett, both of date April 1. Bryant (1889*b*, p. 265, under the name *Anas americana*) found it near Loreto and at San Raimundo in March. Willett (1913, p. 21) took it at Colnett, April 8. Townsend (1923, p. 9) found it at Ángel de La Guardia Island, April 10. Huey (1926, p. 351) found non-breeders at La Grulla on the Sierra San Pedro Mártir in June. Murphy (1917, p. 82) saw many near Mexicali the last of March. The record of *Anas penelope* by Price (1899, p. 90) from the lower Colorado River pertains, of course, to the present species. Skins in the Museum of Vertebrate Zoology were obtained at San Ramón, December 8, 1925, and in the Colorado delta, seven miles east of Cerro Prieto, March 10, 1928.

***Nettion carolinense* (Gmelin)**

Green-winged Teal

Varyingly common winter visitant to localities wherever fresh water is available south through the peninsula for its entire length. First recorded by Ridgway (in Belding, 1883*b*, p. 534) as taken by Xantus at San José del Cabo in January and February. Other records are: the Cape region, "moderately common" (Belding, 1883*c*, p. 352); San José del Cabo, September 18 to middle of October (Brewster, 1902, p. 43); La Paz, March 28 (Townsend, 1923, p. 9); San Quintín, April (Howell, 1911, p. 152); Mexicali, and delta region generally (Murphy, 1917; p. 82, Price, 1899, p. 90, Rhoads, 1905, p. 688). The ascription by Bryant (1889*b*, p. 265, under the name *Anas carolinensis*) to, by implication, the Sierra San Pedro Mártir was a mistake (see Anthony, 1893, p. 231).

***Querquedula discors* (Linnaeus)**

Blue-winged Teal

Rare visitant. Only two published records: San José del Cabo (Belding, 1883*b*, p. 548), "mated" and "common" May 17, 1882; San Ramón "a few" seen by Anthony in April [1888?] (Bryant, 1889*b*, p. 265, under the name *Anas discors*). It would be difficult to accept Belding's record if it were not that he gives the Cinnamon Teal also; and furthermore, C. C. Lamb tells me that he himself found this teal "common" at San José del Cabo from January to April, 1923, and took specimens.

***Querquedula cyanoptera* (Vieillot)**

Cinnamon Teal

Fairly common in spring and summer at points where fresh-water ponds or streams occur, the whole length of the peninsula. First recorded by Belding (1883*b*, p. 548) as present at San José del Cabo, though "rare," May 17. Subsequent records are: San José del Cabo, in fall up at least to last of September (Brewster, 1902, p. 44); Purísima Cañon [near lat. 26°], April 5 (Bryant, 1889*b*, p. 266, under the name *Anas cyanoptera*); San Fernando, April 26 (Anthony, 1895*d*, p. 136); Colnett, April 7 and 8, and near Santo Tomás [lat. 31° 35'], April 6 (Willett, 1913, p. 21); Volcano Lake, in Colorado delta, April 26 (Murphy, 1917, p. 83); La Grulla meadows, on Sierra San Pedro Mártir, in May, nesting

(Anthony, 1893, p. 230); San Rafael Valley, east of Ensenada, "many" nesting (Bryant, *loc. cit.*); Ojos Negros, in San Rafael Valley, breeding (Huey, 1928a, p. 158). Specimens in the Museum of Vertebrate Zoology taken by C. C. Lamb at San Ramón, mouth of Santo Domingo River, December 29, 1925, and by J. E. Green near Cerro Prieto in the Colorado delta, February 10, 1928, indicate occasional wintering of the species within the territory.

***Spatula clypeata* (Linnaeus)**

Shoveller Duck

Common winter visitant at scattering suitable points south throughout the peninsula. First recorded by Belding (1883b, p. 548) as present at San José del Cabo up to May 17. Recorded by Brewster (1902, p. 45) from San José del Cabo, as early in the fall as October 18, and from La Paz, March 2. Other records are: San Quintín, in April (Howell, 1911, p. 152); Colnett, April 7 and 8 (Willett, 1913, p. 21); Comondú and Purísima Cañon, in April, and San Rafael Valley, east of Ensenada, May 12 (Bryant, 1889b, p. 266); Colorado delta, December to February (Price, 1899, p. 90, Rhoads, 1905, p. 688, Bancroft, 1922, p. 98). A skin in the Museum of Vertebrate Zoology was obtained at Santa María, five miles south of San Quintín, December 30, 1925.

***Dafila acuta tzitzihua* (Vieillot)**

American Pintail Duck

Common winter visitant at suitable points south throughout the peninsula. First recorded by Ridgway (*in* Belding, 1883b, p. 534, under the name *Dafila acuta*) as taken by Xantus at San José del Cabo in January. Belding (1883c, p. 352) considered this duck "common" in the Cape region. Brewster (1902, p. 45) says that Frazar shot the first in the fall at San José del Cabo on August 29; a large flock was seen September 2; and by September 20, Pintails were "abundant." Bryant (1889b, p. 266) noted the species in Purísima Cañon [close to lat. 26°], April 5, and records that the species was found by Belding in San Rafael Valley, east of Ensenada, May 12. Huey (1927g, p. 243) observed a flock at Pond Lagoon, April 13 to 17. Howell (1911, p. 152) found it near San Quintín in April. Rhoads (1905, p. 688) observed it in the Colorado delta in February. Murphy (1917, p. 83) saw it near Mexicali, March 29. There are specimens in the Museum of Vertebrate Zoology from Laguna Hanson, in the Sierra Juárez, October 7, 1926, and from La Grulla, on the Sierra San Pedro Mártir, June 8, 1926. The latter occurrence, as well as the above cited one in San Rafael Valley, leads toward the belief that the species occasionally nests in the northern, more elevated parts of the territory.

***Nyroca americana* (Eyton)**

Redhead Duck

Rather uncommon winter visitant. All the records I know of are as follows: one shot at La Paz, February 12, 1883 (Belding, 1883c, p. 352, under the name *Aythya americana*); one seen by Belding at San Rafael, east of Ensenada, May 12, and one at Trinidad [near lat. 31° 20'], May 14, both in 1885 (Bryant, 1889b, p. 266, under *Aythya americana*); one specimen from San José del Cabo, March 26, 1911 (Townsend, 1923, p. 8, under *Marila americana*); near Mexicali and south of there, "observed sparingly" up to the end of April, 1915 (Murphy, 1917, p. 83). In the Museum of Vertebrate Zoology is a specimen taken in the Colorado delta, five miles east of Cerro Prieto, February 10, 1928.

***Nyroca valisineria* (Wilson)**

Canvas-back Duck

Winter visitant, apparently irregularly so and only toward the north. According to the statement of an experienced sportsman (Nordhoff, 1922, p. 64, under the name *Marila valisineria*) "many . . . winter in the lakes of the San Pedro Mártir Mountains," though he had not seen it "on either coast of the Peninsula." C. C. Lamb (MS) saw "quite a few" Canvas-backs about the freshwater sloughs at Santa María, five miles south of San Quintín, December 30, 1925, and obtained a specimen (in Mus. Vert. Zool.). Huey (1927*g*, p. 243) observed a "small flock" April 13 to 17, 1927, at Pond Lagoon; this locality, near latitude 27°, is the southernmost known station to date.

***Nyroca marila* (Linnaeus)**

Greater Scaup Duck

Rare winter visitant at the extreme north. One verifiable instance of occurrence: Specimen in Museum of Vertebrate Zoology (female, no. 52068) taken by C. C. Lamb in the Colorado delta one mile northeast of Cerro Prieto, February 7, 1928.

***Nyroca affinis* (Eyton)**

Lesser Scaup Duck

Common winter visitant south along both coasts of the peninsula to its extremity. First recorded by Belding (1883*c*, p. 352, under the name *Fulix affinis*) from the Cape region. Other records are: San José del Cabo, "abundant" in midwinter (Brewster, 1902, p. 46, under *Aythya affinis*); Magdalena Bay, lower Purísima Cañon, and San Raimundo [both the last near lat. 26°], San Rafael [east of Ensenada] on May 12, and near Ensenada in December (Bryant, 1889*b*, p. 266); Pond Lagoon, April 13 to 17 (Huey, 1927*g*, p. 243); San Quintín in April (Howell, 1911, p. 152, under *Marila affinis*); San Martín Island in March and April (Kaeding, 1905, p. 110, and Willett, 1913, p. 21); Ángel de La Guardia Island in April, and San José Island and La Paz in March (Townsend, 1923, p. 8); San Felipe, in March and April (Huey, 1927*d*, p. 20); lower Colorado River in December (Price, 1899, p. 90); south of Mexicali, March 29 (Murphy, 1917, p. 83). Specimens in the Museum of Vertebrate Zoology were obtained at San Ramón, December 10, 1925, and at San Felipe, March 27, 1926.

***Glaucionetta clangula americana* (Bonaparte)**

American Golden-eye Duck

Rare winter visitant at the north. Cooke (1906, p. 50, under the name *Clangula clangula americana*) records this species from "northeastern Lower California" in winter, but without any details. Since Phillips (1925, p. 304, under *Bucephala clangula*) gives full acceptance to this statement, I was sure it must have been well founded. Subsequently, I made enquiry of Dr. H. C. Oberholser, of the United States Biological Survey, who (under date January 29, 1927) furnishes satisfactory confirmation, with details as follows, from notes of F. Stephens on file: Salt Slough, northeastern Lower California, "not common, ♀ shot, December 1-14, 1896." The Museum of Vertebrate Zoology contains a specimen (no. 47868) taken by C. C. Lamb at San Felipe, on the Gulf, April 12, 1926.

Charitonetta albeola (Linnaeus)

Buffle-head Duck

Winter visitant, northerly. Records few: Bryant (1889*b*, p. 267) "shot a male at lower Purísima cañon" [near lat. 26°] on April 5, 1889. Bryant (*loc. cit.*) further states that Anthony had "found it common at San Quintín in winter." W. M. Pierce (MS) found a dozen or so, and shot one, on the marshes of San Telmo River, near the ocean, lat. 31°, December 30 and 31, 1924; C. C. Lamb (MS) saw "quite a few" around the extensive sloughs at Santa María, five miles south of San Quintín, December 30, 1925; and Huey (1927, p. 240) reports seeing one bird at San Ignacio Lagoon, April 12, 1927. Price (1899, p. 90) indicates that he saw "several" on the lower Colorado River in December. Recorded also under the name *Bucephala albeola* (Phillips, 1925, p. 337).

Melanitta deglandi (Bonaparte)

White-winged Scoter

Winter visitant on salt water at the north. Bryant (1889*b*, p. 267, under the name *Oidemia deglandi*) records it from San Quintín Bay in winter. Howell (1911, p. 151) records it as "numerous both outside and inside" San Quintín Bay, the last of April. Price (1899, p. 90) noted it, in December, at the head of the Gulf some twenty miles below Montague Island "near the Californian shore." The species has been credited to Lower California under other names: *Oidemia deglandi dizoni* (A. O. U. Committee, 1923, p. 515); *Oidemia fusca* (Phillips, 1926, p. 33).

Melanitta perspicillata (Linnaeus)

Surf Scoter

Abundant winter visitant along both coasts of the peninsula, northerly. First recorded from "Lower California" by Baird, Brewer and Ridgway (1884, II, p. 99, under the name *Pelionetta perspicillata*), but upon what exact basis I have not learned. Other records are: Ensenada, "common," and San Quintín Bay, "in swarms" in winter (Bryant, 1889*b*, p. 267, under *Oidemia perspicillata*); a few, doubtless non-breeding birds, on San Quintín Bay in summer, and "abundant all along the coast" in winter (Anthony, 1925, p. 290); Pond Lagoon [southernmost station to date], April 13 to 17 (Huey, 1927*g*, p. 243); around San Martín Island, "a few" March 12 (Kaeding, 1905, p. 110); Turtle Bay, a specimen November 8, 1884 (Townsend, MS); Angel de La Guardia Island, "a few," April 10 and 11 (Townsend, 1923, p. 9); San Felipe, on the Gulf, April 7 (skull in Mus. Vert. Zool.); at the head of the Gulf, "by the acre in winter" (Sanford, Bishop and Van Dyke, 1903, p. 531). With the last statement in mind, one is led to wonder by what route this sea duck, which usually sticks closely to salt water, gets out of the Gulf in spring, in going to its subarctic summer quarters, and by what route it gets back into the Gulf again, in the fall—when there are seemingly no records for it from around the Cape district!

Erismatura jamaicensis rubida (Wilson)

Northern Ruddy Duck

Common resident, locally, at suitable points the whole length of the peninsula. First recorded by Ridgway (*in* Belding, 1883*b*, p. 534, under the name *Erismatura rubida*) as taken, December to February, by Xantus at San José del Cabo,

Laguna de Santiago, and "Saint Lazaro Mountains," all being points in the Cape district. Belding (1883c, p. 351) found the species "very common" at La Paz and to the southward; and according to Brewster (1902, p. 46, under *Erismatura jamaicensis*), Frazar found a large breeding colony at Santiago [about lat. 23° 25']. Bryant (1889b, p. 267) found the species at San Raimundo and at lower Purísima Cañon [about lat. 26°] in April, and he further states that Anthony had found it "nesting at lat. 31°." Huey (1928a, p. 158) reports it as breeding at Laguna Hanson, 5200 feet altitude. Howell (1911, p. 152) found it near San Quintín in April; and Willett (1913, p. 21) found it at Colnett in April. Anthony (1925, p. 290) records a single bird "in San Quintín Bay" in July or August. Rhoads (1905, p. 688) observed this species in the Colorado delta in February; and Bancroft (1922, p. 98) found it at Volcano Lake in January. The Museum of Vertebrate Zoology contains a specimen taken near Cerro Prieto, in the Colorado delta, February 11, 1928. Another name used for this duck is *Oxyura jamaicensis* (Phillips, 1926, p. 162).

***Chen hyperboreus hyperboreus* (Pallas)**

Lesser Snow Goose

Winter visitant, apparently in considerable numbers, to the Colorado delta, whence recorded by Rhoads (1905, p. 688) as being seen in February "in great flocks" at "Cocopah Major" [El Major], and at the mouth of the Hardy River. Also Bancroft (1922, p. 98) reports this goose as noted regularly every winter at Volcano Lake. Huey (1927d, p. 20) reports seeing Snow Geese near San Felipe, on the Gulf, March 26. The Museum of Vertebrate Zoology contains a specimen taken by C. C. Lamb on the Colorado River eighteen miles southeast of El Major, February 10, 1928.

***Anser albifrons albifrons* (Scopoli)**

Common White-fronted Goose

Has occurred sporadically as a winter visitant. The first record (Bryant, 1887a, p. 279, under the name *Anser albifrons gambeli*) was of a lone straggler shot on Guadalupe Island, January 14, 1885. Bryant (1889b, p. 267) was told by Belding of a hunter having "shot one out of a group of four [date not given] at Los Mártires, between La Paz and San José del Cabo." These are the only occurrences that I have discovered. The last is probably the basis of the statement one often sees, that the species ranges south in winter "to Cape San Lucas."

***Branta canadensis hutchinsii* (Richardson)**

Hutchins Canada Goose

Winter visitant, probably commonly to the Colorado delta and sporadically to other suitable places in northern Lower California. First recorded by Bryant (1889b, p. 267) as having been seen by Anthony, "a few" in the fall, in San Rafael Valley, east of Ensenada. Price (1899, p. 90) reports finding a "brant" (he calls it *Branta bernicla*) abundant in December along the lower Colorado River, on the nearby Laguna Salada, and along the Hardy River. Rhoads (1905, p. 688) also found a race of Canada Goose numerous in the delta region, in February. Actual specimens appear to be wanting, so that, while the species is certain, the subspecies is, perhaps, not.

***Branta nigricans* (Lawrence)**

Black Sea Brant

Common winter visitant along the west side of the northern two-thirds of the peninsula. First recorded by Belding (1883a, p. 529, under the name *Bernicla nigricans*) from San Quintín Bay, flocks seen up to May 9 or 10. From the same bay, on authority of Anthony, Bryant (1889b, p. 267) reports the species to "swarm" until May 15. Nordhoff (1922, p. 64), too, says that it winters "in vast numbers on San Quintín Bay." C. C. Lamb (MS) obtained a specimen (in Mus. Vert. Zool.) out of a large flock flying along the surf at San Ramón, mouth of Santo Domingo River, December 27, 1925. Bryant (1886, p. 63) found it at Cedros Island in January. Willett (1913, p. 21) reports it in April from Colnett Bay, San Gerónimo Island, and Cedros Island. Lamb (MS) saw many in January, 1927, off Todos Santos Islands. Kaeding (1905, p. 110) reports it from around San Gerónimo and San Martín islands, in March. Nelson (1921, p. 134) says Scammon Lagoon is one of "the main winter homes" of the Black Brant. Lamb (1927a, p. 69) has found it in midwinter "in great flocks" around Natividad Island. Huey (1927g, p. 242) saw a "bunch of about 200" at San Ignacio Lagoon, April 18, 1927. The southernmost known occurrence is Magdalena Bay (Van Dyke, in Sanford, Bishop and Van Dyke, 1903, p. 544). There is but one record from Gulf waters, and that one, from San Felipe (Huey, 1927d, p. 20), not quite conclusive. The name combination, *Branta bernicla nigricans*, has been used in ascribing this goose to Lower California (see Bent, 1925, p. 258).

***Dendrocygna bicolor* (Vieillot)**

Fulvous Tree-duck

Of occurrence rarely and only in the northern end of the territory under consideration. Three records: Bryant (1889b, p. 267, under the name *Dendrocygna fulva*) says: "Reported numerous in autumn at San Rafael [25 miles east of Ensenada], where Mr. Belding's companion [in 1885], Mr. Walter Morgan, shot several dozen." Willett (1913, p. 21) saw "several" at Colnett, April 7 and 8, 1912. Bancroft (1922, p. 98) found "a pair" in the Colorado delta region near "Hecheira," January 24, 1922.

***Cygnus columbianus* (Ord)**

Whistling Swan

Rare winter visitant to the extreme northern end of the territory. Two records: Bryant (1889b, p. 268, under the name *Olor columbianus*) reports a swan killed at San Rafael, some 25 miles east of Ensenada. Huey (1926, p. 351) has reason to believe that this bird visits Laguna Hanson, Sierra Juárez, regularly; he has seen three specimens from there, two of them of dates December 13, 1923, and November 16, 1924.

***Ajaja ajaja* (Linnaeus)**

Roseate Spoonbill

Known definitely only as a sporadic summer visitant to the Colorado delta region. The first ascription is by Nelson (1921, p. 116), who lists the genus as "known from Lower California." Dr. Nelson informs me (in letter of January 15, 1927) that this is based "on five specimens seen, one of which was collected, at Volcano Lake, Colorado River delta, by Luther J. Goldman, June 18, 1915."

Bancroft (1922, p. 98) records the presence of small flocks at Volcano Lake in the summers of 1920 and 1921. Grinnell (1926b, p. 102) examined a specimen from Volcano Lake, one out of a small flock found there by E. W. Funcke about twelve years previously, and cites reports of others south to near the Hardy River.

Guara alba (Linnaeus)

White Ibis

Fairly common resident in the southern end of the peninsula, north locally to about latitude 27°. Recorded first by Belding (1883b, p. 545, under the name *Eudocimus albus*) from the Cape region. Brewster (1902, p. 48) more definitely reports it as common about La Paz and San José del Cabo. Thayer (1909a, p. 11) records eggs from La Paz. Lamb (1927b, p. 156) reports the species as "scarce" at La Paz in 1924. Regularly present on the Pacific side at Santa Margarita Island and Magdalena Bay (Bryant, 1889b, p. 268, and several subsequent writers), and as far north as San Ignacio Lagoon, breeding (Bancroft, 1927b, p. 194). The northernmost station of known occurrence in the Gulf is San José Island, where found "rather common" the last of March by Townsend (1923, p. 9).

Plegadis guarauna (Linnaeus)

White-faced Glossy Ibis

Irregularly present in spring, summer and fall at widely scattered localities. First recorded by Belding (1883b, pp. 545, 548) from the Cape region, where he found a flock at San José del Cabo "in April and May." At the same place, Bryant (1891, p. 189) found "flocks" in September, as also did Frazar (Brewster, 1902, p. 48); the latter collector observed one bird at Santiago, November 19. Townsend (1923, p. 9) records two specimens taken at San José del Cabo, April 22. Murphy (1917, p. 83) observed "a dozen or more" near Volcano Lake in the Colorado delta, April 26. And Anthony (1893, p. 231) reports the species as seen in small numbers "during summer" (possibly breeding) about a marsh near San Telmo, and birds shot at San Quintín "in October."

Mycteria americana Linnaeus

Wood Ibis

Sporadic visitant, apparently irrespective of season, at far separated localities. Recorded first by Belding (1883b, pp. 545, 548, under the name *Tantalus loculator*) from the Cape region, where a pair was seen at San José del Cabo in April and May. According to Bryant (1889b, p. 268), Belding also found this species at La Paz, where it was more common "in winter." Frazar found it at La Paz, as, too, at San José del Cabo in September and October (Brewster, 1902, p. 49). Anthony (1893, p. 231) reports it as found "in the fall" "in all of the marshes and streams from Ensenada to Santa María [near San Quintín]." Rhoads (1905, p. 688) saw "a few" in the Colorado delta in February. Lamb (MS) saw the species in May, 1924, at Loreto, on the Gulf coast.

Botaurus lentiginosus (Montagu)

American Bittern

Fairly common winter visitant to the far scattered localities of suitable nature almost the whole length of the peninsula. Remains through the summer at the north. Recorded first by Ridgway (in Belding, 1883b, p. 533) as taken by Xantus at Cape San Lucas November 4, and at San José del Cabo November 29 and 30.

Belding (1883*c*, p. 351) also found it in the Cape region, in winter, as did Frazar, at San José del Cabo, from September to November 11. Townsend (1923, p. 9) reports a specimen from Magdalena Bay, March 20; and Huey (1927*g*, p. 242) records the species from San Ignacio Lagoon, April 11. Anthony (1893, p. 231) found it "common" in the marshes at Colnett and San Ramón, where, he says, "it doubtless nests." There is a skin from San Ramón in the Museum of Vertebrate Zoology, taken by C. C. Lamb, December 8, 1925; also in the same collection one taken by the same collector in the Colorado delta, seven miles east of Cerro Prieto, March 10, 1928.

***Ixobrychus exilis hesperis* Dickey and van Rossem**

Western Least Bittern

Sparingly transient and summer resident. Only four recorded stations of occurrence: San José del Cabo, August 29 to October 21 [1887], "in considerable numbers" (Brewster, 1902, p. 50, under the name *Ardetta exilis*); San José del Cabo, February 6, 1923, and La Paz, September 21, 1923 (Lamb, 1927*b*, p. 156); Purisima [near lat. 26° 10'], "breeding" (Bent, 1926, p. 91); overflow of Hardy River, in Colorado delta, April 26 [1915], "one seen" (Murphy, 1917, p. 83, under the name *Ixobrychus exilis*). In addition, there is in the Museum of Vertebrate Zoology a specimen taken at a point in the Colorado delta seven miles east of Cerro Prieto, May 25, 1928.

***Ardea herodias hyperonca* Oberholser**

California Great Blue Heron

Common resident of the northwestern seacoast and nearby islands, from the United States boundary south to about latitude 27°. First recorded from within the assumed range of this race by Anthony (1893, p. 231, under the name *Ardea herodias*), as "common at San Quintín and north of that point," and nesting on San Martín Island. Bancroft (1927*a*, p. 44) reports a colony nesting ten miles from Tijuana. Some other stations of occurrence are: Los Coronados Islands (Wright, 1909, p. 100, and Howell, 1917, p. 44); Guadalupe Island (Gaylord, 1897*a*, p. 42, and Anthony, 1925, p. 291, the latter under the name *Ardea herodias sanctilucae*); Natividad Island (Lamb, 1927*a*, p. 69); Scammons Lagoon (Bancroft, 1927*a*, p. 40).

***Ardea herodias treganzai* Court**

Pallid Great Blue Heron

Locally common south from the United States boundary, from vicinity of Mexicali eastward, through the Colorado delta and thence south along the Gulf coast of the peninsula and among the adjacent islands an unknown distance before gradual merge with the southern race, *sanctilucae*. A specimen (no. 47869, Mus. Vert. Zool.) from San Felipe, taken April 17, 1926, is intermediate, nearest *treganzai* (see also Huey, 1927*d*, p. 21). Another skin in the Museum of Vertebrate Zoology, taken in the delta fifteen miles southeast of Cerro Prieto, February 22, 1928, is unquestionably *treganzai*. The record from Ángel de La Guardia Island (Townsend, 1923, p. 9) may be put here provisionally, as also the one from San Luis Island (Bancroft, 1927*a*, p. 40). First recorded, from along the lower Colorado River, by Price (1899, p. 91, under the name *Ardea herodias*), whence reported "abundant" in December. Rhoads (1905, p. 688) found it

"abundant" in the delta in February. Oberholser (1912b, pp. 545-548) gives details in regard to a specimen from "Gardner's Laguna, Salton River," where indicated as breeding. Murphy (1917, p. 83) found this heron "common" in April on the Hardy River.

***Ardea herodias sancti-lucae* Thayer and Bangs**

Espíritu Santo Great Blue Heron

Common resident, locally, about the islands and along both seacoasts of the lower end of the peninsula, north to about latitude 27°. First recorded by Belding (1883b, p. 548, under the name *Ardea herodias*), from San José del Cabo. However, had previously been taken by Xantus, at Cape San Lucas (Baird, Brewer and Ridgway, 1884, I, p. 15). On the Pacific side, recorded from Santa Margarita Island and Magdalena Bay (Bryant, 1889b, p. 268, and McLellan, 1926, p. 292), and from Pond Lagoon [subspecies in doubt] (Huey, 1927g, p. 243); on the Gulf side from: near La Paz, breeding (Thayer, 1909a, p. 11, Brewster, 1902, p. 51, and Lamb, 1927b, p. 156); San José Island, breeding (Nelson, 1921, p. 92); Cerralvo Island, breeding (Mailliard, 1923, p. 453); Idefonso Island, nesting (Lamb, 1924, p. 63); San José and Espíritu Santo islands, breeding (Bent, 1926, p. 130). The subspecies *sancti-lucae* was described by Thayer and Bangs (1912, p. 83), with type [no. 18303 in Thayer coll.] from Espíritu Santo Island, taken by W. W. Brown, Jr., June 13, 1910. For a critical review see: Oberholser (1912b, p. 548).

***Casmerodius albus egretta* (Gmelin)**

American White Egret

Of sparse and sporadic occurrence, irrespective of season. Recorded from a few widely separated points, as follows: The Cape district, more specifically San José del Cabo, where "several" were seen May 17 (Belding, 1883b, pp. 544, 548, under the name *Herodias egretta*); San José del Cabo in August (Brewster, 1902, p. 51, under *Ardea egretta*); Magdalena Bay and vicinity, "tolerably common" in winter and spring, and one "large flock" seen which might have meant "a nesting colony" (Bryant, 1889b, p. 268); San Ignacio Lagoon, "breeds" (Bancroft, 1927b, p. 194); Pond Lagoon, April (Huey, 1927g, p. 243); Hardy River, Volcano Lake and elsewhere in the Colorado delta, "many" March 30 to April 26 (Murphy, 1917, p. 83). Two specimens in the Museum of Vertebrate Zoology were obtained in the delta fifteen miles southeast of Cerro Prieto, February 23, 1928. Bent (1926, p. 145, under *Casmerodius egretta*) includes San José del Cabo and Santa Margarita Island as within the "breeding range" of the species, but upon what evidence is not stated.

***Egretta thula thula* (Molina)**

Common Snowy Heron

At one time common in suitable parts of the northern end of Lower California. Recorded by Anthony (1893, p. 231, under the name *Ardea candidissima*) as "very common all along the coast from El Rosario [lat. 30°] north," and thought to be nesting at San Ramón because seen there all summer. "At least two" seen in July near San Quintín (Howell 1911, p. 152, under *Egretta candidissima*). "Several" seen in February on the Hardy River, in the Colorado delta (Rhoads, 1905, p. 688). Seen near Volcano Lake and elsewhere in the delta, in April (Murphy, 1917, p. 84). "Breeds in the Delta of the Colorado"

(Bancroft, 1927a, p. 42). A specimen in the Museum of Vertebrate Zoology was obtained in the delta fifteen miles southeast of Cerro Prieto, February 22, 1928. This example shows rather large dimensions for true *thula* and may be interpreted as showing a tendency toward *brewsteri*.

***Egretta thula brewsteri* Thayer and Bangs**

Brewster Snowy Heron

Fairly common resident locally from the Cape district north, supposedly, to about latitude 29°. First recorded by Baird (1859, p. 305, under the name *Garzetta thula*) as taken by Xantus at Cape San Lucas. Belding (1883b, p. 548, under *Garzetta candidissima*) records "several" as seen at San José del Cabo in May. Brewster (1902, p. 51, under *Ardea candidissima*) records the species from La Paz in winter and from San José del Cabo in "early autumn." Thayer (1909a, p. 11, under *Egretta candidissima*) reports it as breeding at La Paz. Bryant (1889b, p. 269) reports the species as "rare" at Magdalena Bay and, to the northward, in the vicinity of Comondú. Bancroft (1927a, p. 42) records a small breeding colony at Scammons Lagoon; and Huey (1927g, p. 241) reports the species from San Ignacio Lagoon. The subspecies was described by Thayer and Bangs (1909, p. 40) under the name *Egretta candidissima brewsteri*, with type [no. 11419 in Thayer coll.] from San José Island, taken June 20, 1908, by W. W. Brown, Jr., who also found the species nesting there (see Bent, 1926, p. 156). Townsend (1923, p. 9) obtained a specimen at San Francisquito Bay [about lat. 28° 26'], April 9. This specimen is now no. 305750, U. S. Nat. Mus. Its measurements are small, equivocal indeed; so that the bird may have been either an individual extreme of *brewsteri*, or a southward vagrant of *thula*, or else an intermediate in the true subspecific sense.

***Dichromanassa rufescens dickeyi* van Rossem**

Lower California Reddish Egret

Fairly common resident at suitable points on both coasts, chiefly southerly. First recorded by Ridgway (1883e, p. 143, under the name *Dichromanassa rufa*), as taken by Xantus at Cape San Lucas, December 6, 1859. Belding (1883b, pp. 544, 548) found it "common" generally in the Cape district, though "rare" at San José del Cabo in May. Brewster (1902, p. 52, under *Ardea rufescens*) records the species as met with by Frazar both at La Paz and San José del Cabo, but "not commonly at either place." Bryant (1889b, p. 269) records it as "tolerably common" at Santa Margarita Island; Huey (1927g, p. 241) records it from San Ignacio Lagoon; Bancroft (1927a, p. 42) reports it breeding at Scammons Lagoon; and Anthony (1893, p. 231, under *Ardea rufa*) designates it as "not uncommon" at San Quintín, this being the northernmost station for the species on the Pacific coast. Townsend (1923, p. 10, under *Dichromanassa rufescens*) reports the species from Magdalena Bay on the Pacific side, and from San José Island and Concepción Bay on the Gulf side. Mailliard (1923, pp. 451, 454) records it as nesting on Ángel de La Guardia Island and the nearby Granite Island. The new race, *D. r. dickeyi* van Rossem (1926c, p. 246), was named from San Luis Island, in the Gulf [lat. 30°]; type [no. 15112 in Dickey coll.] taken April 13, 1925, by A. J. van Rossem. Its tenability has been doubted, by Griscom (1926, p. 9), who lists Lower Californian specimens under the name *Dichromanassa rufescens rufescens*.

***Hydranassa tricolor ruficollis* (Gosse)**

Louisiana Heron

Fairly common resident at widely separated localities, mostly far south. First reported by Belding (1883*b*, pp. 544, 548, under the name *Hydranassa tricolor ludoviciana*) as met with generally in the Cape region, though "rare" at San José del Cabo in May. At both this place and La Paz, Frazar found it "common" (Brewster, 1902, p. 52, under *Ardea tricolor ruficollis*). Bryant (1889*b*, p. 269) found a very few at Santa Margarita Island and Magdalena Bay. Anthony (1925, p. 291) found it "common" at the latter locality in the summer of 1922, and remarks that "formerly" he took specimens as far north as San Quintín. A specimen from San Quintín is contained in the Museum of Vertebrate Zoology, taken by C. C. Lamb, December 19, 1925. Townsend (1923, p. 10) reports the species from Magdalena Bay, and also from Concepción Bay on the Gulf side. Bancroft (1927*a*, p. 44) has located a breeding place, at Scammons Lagoon; and Huey (1927*g*, p. 241) has found the species at San Ignacio Lagoon. A supposed new subspecies, *Hydranassa tricolor occidentalis*, was named by Huey (1927*h*, p. 83), with type [no. 10644, in coll. San Diego Soc. Nat. Hist.] from Scammon Lagoon. But in the opinion of Mr. A. J. van Rossem it is not tenable. He says (*in litt.*) that "material examined in eastern museums shows great range of variation in birds of the South Atlantic portion of North America, quite including the extremes in size recorded by Huey from Lower California. Neither does there appear to be even an average color difference."

***Florida caerulea caerulea* (Linnaeus)**

Northern Little Blue Heron

Rare. Reported by but two explorers: Townsend (1923, p. 10) records one specimen as taken at Magdalena Bay, March 21, 1911, and several individuals as seen at La Paz, April 18 the same year. Lamb (1925*d*, p. 117) reports one specimen taken at La Paz, February 28, 1924, and two at Todos Santos [lat. 23° 27'], one October 28, 1923, and the other September 15, 1924.

***Butorides virescens anthonyi* (Mearns)**

Anthony Green Heron

Apparently only a transient (or winter visitant) in the Cape district, while at the north present throughout the summer in suitable places, and probably breeding. This subspecies was first recorded from the territory by Mearns (1895, p. 257) when he described as new, *Ardea virescens anthonyi*, with type [no. 135576 in U. S. Nat. Mus.] taken by himself; April 12, 1894, at Seven Wells, Salton River, near Monument 213 of the international boundary. Later, recorded from places in the delta: in midwinter, one bird taken, by Price (1899, p. 91, under *Ardea virescens*), and in April, "common," by Murphy (1917, p. 84). The Museum of Vertebrate Zoology contains skins from seven miles east of Cerro Prieto, taken March 11, May 24, and June 12, 1928, and from San Felipe, taken April 14, 1926. On the Pacific side, reported from San Ramón, June 6, and El Rosario, May 11 (Huey, 1926, p. 351). Brewster (1902, p. 54) records this race as common at San José del Cabo, August 25 to about October 15, with a "straggler" up to November 11. Oberholser (1912*a*, p. 545) records a bird from the same place January 8, and specimens also from San Fernando, San Ignacio, and Gardner's Laguna (the last in the Colorado Delta region). Bent (1926, p. 197) in-

cludes Miraflores in the "winter range" of this race, and Los Coronados Islands in its "breeding range." The latter ascription, so I am informed by Mr. F. C. Lincoln, was based on Oberholser's (1912a, p. 543) statement of its occurrence "in summer" on those islands; and this was based on the capture of a specimen by A. W. Anthony, May 11, 1885 (see Howell, 1917, p. 44). This bird was, of course, merely a straggler or transient individual.

***Butorides virescens frazari* (Brewster)**

Frazar Green Heron

Resident, locally common, in the Cape district and north as far as San Ignacio, latitude 27° 20'. First recorded (probably this race) by Belding (1883b, p. 544, under the name *Butorides virescens*) from the Cape region. Newly described by Brewster (1888a, p. 83), under the name *Ardea virescens frazari*; type [now no. 214134 in Mus. Comp. Zool.] from La Paz, where taken by M. A. Frazar, February 7, 1887; according to Frazar, "common" there (Brewster, 1902, p. 53); also breeding, according to Thayer (1909a, p. 10). Bryant (1889b, p. 269) found this heron at Santa Margarita Island and at Comondú, and records a specimen from Magdalena Bay, whence Anthony (1925, p. 291) also records it. Townsend (1923, p. 10) records it from Santa María Bay on the Pacific side, and from San José Island and Mulegé on the Gulf side. Oberholser (1912a, p. 542), in his Revision, gives the following definite localities for specimens examined: La Paz, San Ignacio, San José Island, and Puerto Ballandra. Bancroft (1927b, p. 194) records this heron as breeding abundantly at San Ignacio Lagoon, Huey (1927g, pp. 241, 243) records it from the same place and also from Pond Lagoon, a little farther to the northwestward. A specimen obtained at the inland town of San Ignacio, April 15, 1927, is in the Museum of Vertebrate Zoology.

***Nycticorax nycticorax naevius* (Boddaert)**

American Black-crowned Night Heron

Common resident locally in the northern half of the territory, with some wintering in the Cape district. Recorded first by Belding (1883b, p. 544, under the name *Nycticorax griseus naevius*), from the Cape region. Brewster records it more definitely from La Paz "in winter" and from San José del Cabo "in October." Bryant (1889b, p. 270) reports "a few" seen at Santa Margarita Island in February. Townsend (1923, p. 10) reports this heron from the Pacific side of the peninsula at Abreojos Point, March 16, and Magdalena Bay, March 22; and from the Gulf side at San José Island, March 30, and Concepción Bay, April 5—"apparently" this species. Bancroft (1927a, p. 46) records it definitely as nesting at Scammons Lagoon, and Huey (1927g, p. 241) found evidence of its nesting at San Ignacio Lagoon. In the Colorado delta it is common in winter, and up to the latter part of April, at least, near Mexicali (Price, 1899, p. 91, Stone and Rhoads, 1905, p. 681, and Murphy, 1917, p. 84); Bent (1926, p. 210) includes "mouth of the Colorado River" as within the "breeding range" of this heron. A specimen (in Mus. Vert. Zool.) is at hand taken on the Colorado River twenty miles south of Pilot Knob, October 18, 1927.

***Nyctanassa violacea bancrofti* Huey**

Bancroft Yellow-crowned Night Heron

Common resident, locally, in the southern part of the territory, chiefly or altogether south of latitude 28° 30'. First recorded by Belding (1883b, pp. 544,

548, under the name *Nyctorodius violaceus*) from the Cape region, where designated as "very common" in May at San José del Cabo. Belding also took it at La Paz in February (Ridgway, 1883*e*, p. 144); and Frazar found it common at both places in autumn and winter (Brewster, 1902, p. 55, under *Nycticorax violaceus*). Bryant (1889*b*, p. 270) found this heron nesting commonly about Magdalena Bay in April, as more recently Baneroft (1927*a*, p. 46) has at Scammon Lagoon. Huey (1927*g*, p. 241) found evidence of nesting at San Ignacio Lagoon. Townsend (1923, p. 10, under *Nyctanassa violacea*) reports it from Santa Margarita Island in March; Townsend (MS) from Natividad Island in November; and Kaeding (1905, p. 110) and Anthony (1925, p. 291) from the San Benito Islands, in March and in midsummer, respectively, though there only casually, I judge. I agree with Murphy (1917, p. 85) that reports of this heron from the Colorado delta so far are doubtful. The subspecies was newly described by Huey (1927*b*, p. 167), with type [no. 10654 in San Diego Soc. Nat. Hist.] from Scammon Lagoon, taken by himself, May 25, 1926.

***Megalornis canadensis canadensis* (Linnaeus)**

Little Brown Crane

Winter visitant at the north, chiefly to the Colorado delta region. First recorded by Bryant (1889*b*, p. 270, under the name *Grus mexicana*) who states that Belding had reported it from "Tia Juana Valley in winter and Spring." Belding, himself (1890, p. 4, under the name Sandhill Crane), cites the observation of "an immense migration" in October and November of 1884 from Ensenada to Port San Felipe, on the Gulf, "much of the Peninsula between these localities being no less than 4,000 feet above sea level." Price (1899, p. 91) found the "Sandhill Crane" abundant in December at Laguna Salada and elsewhere in the delta. Rhoads (1905, p. 688) likewise found it "abundant" in the delta, in February, as did Van Dyke (in Sanford, Bishop and Van Dyke, 1903, p. 563), in winter. The Museum of Vertebrate Zoology contains two specimens, normal for *canadensis*, taken by C. C. Lamb in the Colorado delta, one of them one mile northeast of Cerro Prieto, February 7, 1928, the other on the Colorado River at lat. 32° 15', March 1, 1928. The term "Sandhill Crane" formerly stood for both true "*mexicana*" and *canadensis*, and does yet in the minds of most sportsmen. The evidence now available indicates that the conspicuously migrating hordes of cranes are most likely Little Brown.

***Ballus levipes* Bangs**

Light-footed Clapper Rail

Common resident of salt or brackish marshes along the northwestern seacoast of the peninsula from San Quintín Bay northward. First ascribed to this territory by Ridgway (1882*b*, p. 346, under the name *Ballus obsoletus*) upon the basis of a specimen taken by Belding at San Quintín Bay. Belding (1883*a*, p. 529) and Howell (1911, p. 152) both record the nesting of the species at the same place. According to Bryant (1889*b*, p. 270) Anthony considered it "a common resident of all salt marshes" [apparently from San Quintín northward].

***Ballus beldingi* Ridgway**

Belding Clapper Rail

Common resident locally in the Cape district, and thence northward on the Pacific side to latitude 28°. Affects chiefly the mangrove swamps. First recorded, and newly named, by Ridgway (1882*b*, p. 345), with type [no. 86419

in U. S. Nat. Mus.] taken by Lyman Belding on Espíritu Santo Island, February 1, 1882. Belding also found it at La Paz (Baird, Brewer and Ridgway, 1884, I, p. 352, and Belding, 1900, p. 3), as did also Frazar (Brewster, 1902, p. 55); and Thayer (1909a, p. 11) reports it nesting at or near the same place. Bent (1926, p. 267) describes eggs from San José Island. Bryant (1889b, p. 270) and Anthony (1925, p. 291) report rails of supposedly this form from Santa Margarita and Magdalena islands, and from the "estero" leading north from Magdalena Bay. Huey (1927g, pp. 241, 243) records definitely this species as common at San Ignacio Lagoon and Pond Lagoon. Bancroft (1927a, p. 48) found a large rail nesting at Scammons Lagoon, which he referred only with hesitancy to *beldingi*; but subsequent authoritative examination of specimens from that locality leaves no question but that they do belong to the form *beldingi*, here at the northernmost limit of its range.

***Ballus virginianus* Linnaeus**

Virginia Rail

Common resident of fresh-water marshes on the Pacific slope of the northwestern section of the territory; also winters, sparingly, in the Cape district and in the Colorado delta. First recorded by Belding (1889b, p. 270) as taken by Anthony at San Quintín in winter. Other stations of known occurrence are: San José del Cabo, October 3 to November 4 (Brewster, 1902, p. 56); Todos Santos [lat. 23° 27'], October 31 (Lamb, 1927b, p. 156); Pond Lagoon, April 16 (Huey, 1927g, p. 243); Laguna Hanson [5200 feet alt., lat. 32°] and San Ramón, breeding, and El Rosario in May (Huey, 1926, p. 351, and 1928a, p. 159); San Ramón, March 20 and December 11, and San José, 2500 feet, latitude 31°, October 18 (specimens in Mus. Vert. Zool.); Colorado delta, nine miles east of Cerro Prieto, March 9, and on Colorado River at lat. 32° 15', February 28 (skins in Mus. Vert. Zool.).

***Porzana carolina* (Linnaeus)**

Sora Rail

Common transient or winter visitant, locally, from one end of the peninsula to the other; also breeds in the northwestern coastal district. First recorded by Belding (1883b, p. 547) from San José del Cabo, in April. Reported from the same place, in autumn, by Brewster (1902, p. 56). Other stations of occurrence are: La Paz, presumably in winter (Belding, 1883c, p. 351); Santiago, in winter (Thayer, 1909b, p. 142, under the name Carolina Rail); Todos Santos, latitude 23° 27', "common in winter" (Lamb, MS); coast district north of latitude 31°, in spring (Bryant, 1889b, p. 270); Colnett, in April (Willett, 1913, p. 21); San Antonio del Mar, nesting (Bancroft, 1927b, p. 194); Hardy River, in Colorado delta, March 30 (Murphy, 1917, p. 85); Hecheira, southeast of Mexicali, common January 24 (Bancroft, 1922, p. 98); San Telmo, April 6, San Ramón, March 20, near Cerro Prieto, February 4 and March 9 and 10, Colorado River at lat. 32° 15', February 27 and March 2, and San Ignacio, April 28 (specimens in Mus. Vert. Zool.).

***Creciscus jamalcensis coturniculus* (Ridgway)**

California Black Rail

Resident locally in the northwestern coastal district. Nelson (1921, p. 116) listed the genus *Creciscus* as "known from Lower California." The basis of this ascription, as I am informed by Dr. Nelson (in letter of January 15, 1927), is a specimen taken by E. A. Goldman and himself "at San Simón River, south of

San Quintín, August 31, 1905." This is evidently the basis also of the ascription in the A. O. U. Check-List (ed. 3, 1910, p. 104, under the name *Creciscus coturniculus*) to Lower California, "casual," and of the record by Bent (1926, p. 336) from "San Quintín." Huey (1926, p. 351) records a specimen taken June 6, 1925, in "a tule swamp at San Ramón." Indications of breeding were manifest. Huey further (1928a, p. 158) reports hearing the notes of this species in June, 1927, at Sangre de Cristo, west base of Sierra Juárez. In the Museum of Vertebrate Zoology are two specimens taken at San Telmo, April 3 and 6, 1925.

Gallinula chloropus cachinnans Bangs

Florida Gallinule

Apparently a permanent resident, in some numbers, in the Cape district. Found by Frazar at San José del Cabo, September 13 to October 28, and at Santiago "as late as November 15," 1887 (Brewster, 1902, p. 57, under the name *Gallinula galeata*). Bangs (1915, p. 96) records the species from La Paz, and Dickey and van Rossem (1924b, p. 93) from Cape San Lucas. Finally, Lamb (1927b, p. 156) reports it breeding "commonly" at San José del Cabo in 1923. Outside of the Cape district there is so far only one known locality of occurrence: Specimens in the Museum of Vertebrate Zoology taken by C. C. Lamb, March 10, May 25, and June 5, 1928, in the Colorado delta five to seven miles east of Cerro Prieto.

Fulica americana americana Gmelin

North American Coot

Common winter visitant to suitable places throughout the territory; also remains through the summer, and breeds, though very locally. Recorded first by Baird (1859, p. 306) as taken by Xantus at Cape San Lucas. Some other stations of record are: San José del Cabo and Santiago (Brewster, 1902, p. 57); San José del Cabo and Todos Santos [lat. 23° 27'], "breeding," and La Paz and El Oro, rare (Lamb, 1927b, p. 156); Comondú, San Juan, and lower Purísima Cañon [about lat. 26°] (Bryant, 1889b, p. 271); near San Ignacio (Nelson, 1921, p. 33); San Quintín Bay (Howell, 1911, p. 152); Colnett (Willett, 1913, p. 21); San Telmo, breeding, and Sierra San Pedro Mártir [at La Grulla], breeding (Anthony, 1893, p. 231); San José, 2500 feet, October 22 (skin in Mus. Vert. Zool.); El Rosario, San Ramón, La Grulla and Laguna Hanson, breeding (Huey, 1926, p. 351, and 1928a, p. 159); delta of the Colorado River, abundant in winter and early spring (Price, 1899, p. 91, Murphy, 1917, p. 85); Colorado delta, seven miles east of Cerro Prieto, May 25 (downy young in Mus. Vert. Zool.).

Phalaropus fulicarius (Linnaeus)

Red Phalarope

Common spring and fall migrant at sea along the entire western side of the peninsula. First recorded, from the Cape region, by Belding (1883b, p. 545). Some definite instances of occurrence are: near Todos Santos Islands, April 25 (Willett, 1913, p. 21); near Cape San Lucas, June 3 (Kaeding, 1905, p. 110, under the name *Crymophilus fulicarius*); Guadalupe Island, June 27 (Thayer and Bangs, 1908, p. 104); Ensenada and Guadalupe Island, July 11 (Anthony, 1925, p. 291); between Cedros and the San Benito islands, September 6 (McGregor, 1898b, p. 88); near San Gerónimo Island, September 15 (Gaylord, 1897a, p. 41); and Colnett, October 28 (skin in Mus. Vert. Zool.). La Paz Bay (Bryant, 1889b, p. 271) and San Felipe (skin in Mus. Vert. Zool. taken April 17, 1926) are the only Gulf-side stations I have heard of, for this phalarope.

Lobipes lobatus (Linnaeus)

Northern Phalarope

Spring and fall migrant along the western side of the peninsula. Probably regular and abundant; but definite records so far are curiously few, as follows: San Rafael, east of Ensenada, three specimens taken by Belding, May 16 (Bryant, 1889*b*, p. 271, under the name *Phalaropus lobatus*); San José del Cabo, "not uncommon" August 29 to October 7 (Brewster, 1902, p. 58); near San Gerónimo Island, September 15 (Gaylord, 1897*a*, p. 41); common off Los Coronados Islands in May (McGregor, 1898*b*, p. 88); off San Roque Island, August 2 (Anthony, 1925, p. 291); Todos Santos, lat. 23° 27', in September (Lamb, MS).

Steganopus tricolor Vieillot

Wilson Phalarope

Rare spring and fall migrant. But three records: San José del Cabo, spring of 1883, one specimen (Belding, 1883*c*, p. 351, under the name *Steganopus wilsoni*, and Bryant, 1889*b*, p. 271, under *Phalaropus tricolor*); same locality, August 30 and 31, 1887, two specimens (Brewster, 1902, p. 59); near Mexicali, April 14, 1915, one bird (Murphy, 1917, p. 85).

Recurvirostra americana Gmelin

American Avocet

Occurs as a migrant and winter visitant, sometimes commonly, at widely separated points. First reported, by Belding (1883*c*, p. 351), as "not common" in the Cape region. Later, Bryant (1889*b*, p. 271) says that Belding had found it near La Paz. Brewster (1902, p. 59) states that Frazar met with the species at La Paz on February 3, and at San José del Cabo on October 15, 18, and 26. Anthony (1893, p. 231) reports it as "not uncommon at San Quintín, Colnett and Ensenada in fall," but only about fresh water. Murphy (1917, p. 85) found it common in April in the delta region, along the Hardy River and at Volcano Lake. It was also found at the latter point in January by Bancroft (1922, p. 98).

Himantopus mexicanus (Müller)

Black-necked Stilt

Summer resident, transient, or winter visitant, in varying numbers, in different parts of the territory. First recorded by Ridgway (*in* Belding, 1883*b*, p. 534) as taken by Xantus on the Sierra de Santiago [= Victoria Mountains ?] in January, at San José del Cabo in February, and at Cape San Lucas (date not given). Belding (1883*c*, p. 352) also found it in the Cape region, but "not common." Brewster (1902, p. 60) gives it the same status; at San José del Cabo, four specimens were taken September 14 to October 19. Bryant (1889*b*, p. 271) says that Belding had found the species near La Paz, and that Anthony had seen it "during migrations about fresh water on the northwestern part of the peninsula." Howell (1911, p. 152) found it near San Quintín in April. Murphy (1917, p. 85) found the species "abundant" in the delta along the Hardy during the latter part of April, and he found adults and "downy young" at Mexicali on April 14. The Museum of Vertebrate Zoology contains a skin taken at a point in the Colorado delta five miles east of Cerro Prieto, June 5, 1928.

***Capella delicata* (Ord)**

Wilson Snipe

Varyingly common transient and winter visitant, from one end of the peninsula to the other. First recorded, by Ridgway (*in* Belding, 1883*b*, p. 534, under the name *Gallinago wilsoni*), as taken by Xantus at San José del Cabo, November 23. Belding (1883*c*, p. 351) considered it "rare" in the vicinity of La Paz and southward; but Frazar (Brewster, 1902, p. 60, under *Gallinago delicata*) found it in "considerable numbers" at San José del Cabo and Santiago (dates of August 28 to November 17), and a bird was seen near the summit of the Sierra de La Laguna on November 28. Bryant (1889*b*, p. 271) saw a few at Comondú in March and April, and he cites Anthony as having found them in the northwest coast district, from San Fernando to Ensenada. Willett (1913, p. 21) reports it from Colnett, April 8. Specimens in the Museum of Vertebrate Zoology come from Concepción, 6000 feet altitude on the Sierra San Pedro Mártir, taken November 19, 1925, and from the Colorado delta, seven miles east of Cerro Prieto, taken March 10, 1928. Huey (1928*a*, p. 158) records finding a bird at Ojos Negros, near lat. 32°, on June 12, 1927, behaving as though a nest were near; so there is some probability that the species exists in the rôle, also, of summer resident in this northern, elevated part of the territory.

***Limnodromus griseus scolopaceus* (Say)**

Long-billed Dowitcher

Transient or partly winter visitant; reported from one end of the peninsula to the other. First recorded by Bryant (1889*b*, p. 272, under the name *Macrorhamphus scolopaceus*) who found it "common" at Magdalena Bay and along the "estero" north of there; March 7 is given as the date of taking a specimen. Bryant also says Anthony had noted it in the "northwestern coast region." Brewster (1902, p. 61) reports Frazar to have found "large flocks" at San José del Cabo during September and October, with earliest birds on August 28; also common at Santiago up to November 17. Huey (1926, p. 351, and 1927*d*, p. 21) saw a single bird at San Ramón "as late as June 7," and he saw a "small flock" at San Felipe on March 31. There are skins in the Museum of Vertebrate Zoology, of following data: La Grulla, 7200 feet, Sierra San Pedro Mártir, May 29, 1925 (not a normal individual); San Felipe, March 31, 1926. Most recently, Huey (1927*g*, p. 242) found "great flocks" at San Ignacio Lagoon, April 11 and 18, 1927. Howe (1901, pp. 159, 160) refers Lower Californian specimens to *Macrorhamphus griseus*; but I have been over Brewster's Cape birds and concluded that they are all *scolopaceus*, which, moreover, is a recognizable form.

***Canutus canutus rufus* (Wilson)**

American Knot

Rare spring and fall transient. Two records: Two specimens taken on the mud flats near La Paz, September 19 and 24, 1923 (Lamb, 1925*d*, p. 117, under the name *Calidris canutus*); Gulf shore at San Felipe, specimen taken from three seen April 2, 1926, and an individual seen April 7 the same year (Huey, 1927*d*, p. 21).

***Pisobia maculata* (Vieillot)**

Pectoral Sandpiper

Fall transient. One record: Found by Frazar, in 1887, at San José del Cabo "in considerable numbers, and nine specimens taken" between September 2 and October 24 (Brewster, 1902, p. 61, under the name *Tringa maculata*).

***Pisobia bairdii* (Coues)**

Baird Sandpiper

Rather rare transient. Two authentic records. Four specimens taken by Frazar at San José del Cabo "between September 3 and 13," 1887 (Brewster, 1902, p. 62, under the name *Tringa bairdii*); San José del Cabo, "a few" seen and one taken, April 5, 1923, and La Paz, "four," September 24, 1923 (Lamb, 1927*b*, p. 156). Price's (1899, p. 91) statement that he found this species "abundant along the [Colorado] river and Gulf shore" in midwinter must be a mistake, especially inasmuch as he does not list the Least Sandpiper at all.

***Pisobia minutilla* (Vieillot)**

Least Sandpiper

Common spring and fall migrant, with some individuals remaining through the winter. First recorded by Streets (1877, p. 18, under the name *Tringa minutilla*) from San Gerónimo Island. Other stations of definitely reported occurrence are: Todos Santos [lat. 23° 27'], as taken by Xantus (Ridgway, *in* Belding, 1883*b*, p. 534, under the name *Actodromas minutilla*); Carmen Island and San José del Cabo (Brewster, 1902, p. 62); San Quintín, Magdalena Bay, and lower Purísima Cañon [about lat. 26°] (Bryant, 1889*b*, p. 272); San Quintín (specimen in Mus. Vert. Zool. taken December 19, 1925); San Gerónimo, Turtle Bay, and Abreojos Point (Kaeding, 1905, p. 110); Natividad Island (Lamb, 1927*a*, p. 69); Colnett, and San Gerónimo and San Martín islands (Willett, 1913, p. 21); Colnett (skin in Mus. Vert. Zool. taken October 30, 1925); San Bartolomé Bay and Abreojos Point (Townsend, 1923, p. 10); San Ignacio Lagoon (Huey, 1927*g*, p. 242); San Roque Island (Huey, 1927*f*, p. 206); San Felipe (Huey, 1927*d*, p. 21); Colorado delta (Rhoads, 1905, p. 688); Mexicali (Murphy, 1917, p. 86).

***Pelidna alpina sakhalina* (Vieillot)**

Red-backed Dunlin

Common transient and winter visitant, locally. Reported so far only from the Pacific side of the peninsula and from the Cape district. First recorded by Belding (1883*a*, p. 528, under the name *Pelidna alpina americana*) as "abundant" in early May at San Quintín Bay. Belding further (1883*c*, p. 351) records the species as "very common in winter" [of 1882-83] in the Cape region; but strangely it was not found there at all in 1887 by Frazar (see Brewster, 1902, p. 63, under the name *Tringa alpina pacifica*), and Lamb (1927*b*, p. 156) found it but once, near La Paz, December 23, 1923, when "several were seen and two secured." Huey (1927*g*, p. 240) found a flock at San Ignacio Lagoon, April 12. Several flocks were seen by Kaeding (1905, p. 110) at Abreojos Point, April 19. A skin in the Museum of Vertebrate Zoology was obtained at San Quintín, December 19, 1925.

Ereunetes mauri Cabanis

Western Sandpiper

Common spring and fall migrant, appearing at suitable places throughout the whole length of the peninsula. A few winter southerly. First recorded by Belding (1883*a*, p. 529, under the name *Ereunetes pusillus occidentalis*) from San Quintín Bay. Other definite records are: Magdalena Bay (Bryant, 1889*b*, p. 272, under *Ereunetes occidentalis*); San José del Cabo (Brewster, 1902, p. 63); San Bartolomé Bay, Abreojos Point, and Magdalena Bay (Townsend, 1923, p. 10); La Paz (Cooke, 1910, p. 47); San Ignacio Lagoon in April (Huey, 1927*g*, p. 242); Natividad Island, seen "occasionally" in midwinter (Lamb, 1927*a*, p. 69); San Felipe, April 19 to 25, 1926 (Huey, 1927*d*, p. 21, and specimens in Mus. Vert. Zool.); El Valle de la Trinidad, July 1 (Huey, 1928*a*, p. 158).

Calidris alba (Pallas)

Sanderling

Common transient and winter visitant coastwise. Recorded first by Baird (1859, p. 306, under the name *Calidris arcuaria*) as taken by Xantus at Cape San Lucas. Other definitely recorded stations of occurrence are: San Gerónimo Island (Streets, 1877, p. 18); San José del Cabo (Brewster, 1902, p. 64); Todos Santos [lat. 23° 27'] and San José del Cabo (Lamb, 1927*b*, p. 156); Cedros Island (Bryant, 1886, p. 63); San Quintín Bay and Santa Margarita Island (Bryant, 1889*b*, p. 272); San Cristóbal Bay (Sharpe, 1896, p. 534); San Gerónimo Island and Abreojos Point (Kaeding, 1905, p. 110); Natividad Island (Thayer and Bangs, 1907*b*, p. 80, and Lamb, 1927*a*, p. 69); Abreojos Point (Townsend, 1923, p. 11, under *Calidris leucophaea*); San Ignacio Lagoon (Huey, 1927*g*, p. 242); San Felipe, on the Gulf (Huey, 1927*d*, p. 22, and specimens in Mus. Vert. Zool. taken April 15 and 16, 1926).

Limosa fedoa (Linnaeus)

Marbled Godwit

Common transient and winter visitant at many points coastwise; also some birds (non-breeders) remain all through the summer. First recorded by Belding (1883*a*, p. 529) as "abundant in early May" at San Quintín Bay. Subsequent definite records are: the "estero" northward from Magdalena Bay (Bryant, 1889*b*, p. 273); Turtle Bay and San Gerónimo Island (Kaeding, 1905, p. 110); San Martín Island (Willett, 1913, p. 21); Magdalena Bay (Townsend, 1923, p. 11); San José del Cabo and La Paz, in winter (Lamb, 1925*d*, p. 117); Natividad Island, in midwinter (Lamb, 1927*a*, p. 69); San Quintín and other localities north from Magdalena Bay, "sparingly all summer" (Anthony, 1925, p. 292); San Ignacio Lagoon, April (Huey, 1927*g*, p. 242); San Ramón (Huey, 1926, p. 351); San Martín Island, July 20, 1925 (specimen in Mus. Vert. Zool.); head of Gulf, near mouth of Colorado River, "abundant" in December (Price, 1899, p. 91). Another name combination lately used for this bird is *Vetola fedoa* (Ridgway, 1919, p. 185).

Totanus melanoleucus (Gmelin)

Greater Yellow-legs

Common transient widely, and winter visitant at the south. Reported from many points the whole length of the peninsula, first from San José del Cabo and

Cape San Lucas, as taken by Xantus (Ridgway, in Belding, 1883*b*, p. 534). Other definite records are as follows: Cape region, "very common in winter" (Belding, 1883*c*, p. 351); along the "estero" north from Magdalena Bay, and "about fresh water at Comondú and San Pedro" [about lat. 26°] (Bryant, 1889*b*, p. 273); Los Coronados Islands, April 11 (Osburn, 1909, p. 137); Colnett, April 7 (Willett, 1913, p. 21); Abreojos Point and Magdalena Bay, March (Townsend, 1923, p. 11); San Ignacio Lagoon, April 11 and 18 (Huey, 1927*g*, p. 242); Magdalena Bay, July 26 (Anthony, 1925, p. 292); San Ramón, June 7 (Huey, 1926, p. 351); San Felipe, on the Gulf (skin in Mus. Vert. Zool. taken April 7, 1926); Colorado River twenty and forty miles south of Pilot Knob (skins in Mus. Vert. Zool. taken October 18, 1927, and February 28, 1928). Brewster (1902, p. 65) names as new *Totanus melanoleucus frazari* on the basis of a series taken at San José del Cabo and La Paz, the type [now no. 217815 in Mus. Comp. Zool.], taken by M. A. Frazar, October 27, 1887, being from the first-named locality. I have examined this series and much other material with the result that I cannot agree with Bishop (in Sanford, Bishop and Van Dyke, 1903, p. 410) that the name *frazari* appertains to a good race. Indeed, I am unable to "split" the species at all. Another name combination for the full species is *Neoglottis melanoleuca* (Ridgway, 1919, p. 330).

***Totanus flavipes* (Gmelin)**

Lesser Yellow-legs

Fall transient. Only one conclusive record: Found by Frazar at San José del Cabo, August 28 to October 7, 1887; along the middle of September "upwards of two hundred were sometimes seen in a single day" (Brewster, 1902, p. 66); eleven specimens were preserved, now nos. 217797-807 in the Museum of Comparative Zoology (*vide* J. L. Peters). Thus, from that one year's experience, the species would be judged common or even abundant; and yet no one has found it in the Cape district since then! There is another record for Lower California, of a bird possibly of this species shot by R. H. Beck on Los Coronados Islands, April 11, 1908 (Howell, 1917, p. 102); but verification is lacking.

***Tringa solitaria solitaria* Wilson**

Eastern Solitary Sandpiper.

Rare transient; two instances of occurrence: Frazar took an adult male at San José del Cabo, October 28, 1887 (Brewster, 1902, p. 67, under the name *Helodromas solitarius*); I have examined this specimen and checked as correct everything Brewster says about it. In the Museum of Vertebrate Zoology is a specimen (no. 50745) taken by C. C. Lamb at San Ignacio, April 21, 1927.

***Tringa solitaria cinnamomea* (Brewster)**

Western Solitary Sandpiper

Fall transient; one record for midwinter. Reported definitely from the Cape district as follows: as found by Frazar in small numbers at San José del Cabo, August 25 to September 28, 1887 (Brewster, 1902, p. 67, under the name *Helodromas solitarius cinnamomeus*); San José del Cabo and Todos Santos, "rather common," arriving "in early August," Sierra de la Laguna, July 31, 1923, and August 26, 1924, and La Paz in September (Lamb, 1927*b*, p. 156). Cooke (1910, p. 59, notes on both races combined under *Helodromas solitarius*) ascribes the species to "northern Lower California (Stephens)," but without details. Mr.

Frank Stephens (in letter of January 16, 1927) recalls that in December, 1896, he made a collecting trip to the vicinity of "Black Mountain," south of Calexico and near the then course of the Hardy River. The trip was made in the interests of the U. S. Biological Survey, and a list of the birds seen was turned in; but no specimen of the present species was taken. Enquiry of Dr. Oberholser, of the Biological Survey, brought corroboration of Mr. Stephens' recollection, as the latter's manuscript list is found to indicate that he saw the Solitary Sandpiper "several times" in December, 1896, along the Hardy River. This would seem to show over-wintering in certain years in the Colorado delta. The Western Solitary Sandpiper was newly named by Brewster (1890, p. 377) under the name *Totanus solitarius cinnamomeus*, with type [now no. 217735 in Mus. Comp. Zool.] from San José del Cabo, where collected by M. A. Frazar, August 30, 1887. I have examined this type, together with the rest of Brewster's material, and find it to check absolutely with all his statements. Also, after a general review of the case, I concur as to the validity of this subspecies.

Catoptrophorus semipalmatus inornatus (Brewster)

Western Willet

Common as a transient, or a winter visitant, or both, at widely scattered places the whole length of the territory; a few individuals (non-breeders) even remain through the summer at the north. First recorded by Ridgway (*in* Belding, 1883*b*, p. 534, under the name *Symphemia semipalmata*) as taken by Xantus somewhere in the Cape district in January. In the same region, Belding (1883*c*, p. 351) found the species "very common in winter." Frazar found it at La Paz in winter and at San José del Cabo in autumn (earliest September 6), but not numerous at either place (Brewster, 1902, p. 68, under *Symphemia semipalmata inornata*). Some other definite records are: San Gerónimo Island (Streets, 1877, p. 18, under *Totanus semipalmatus*); Abreojos Point in March (Townsend, 1923, p. 11, under *Catoptrophorus semipalmatus*); Magdalena Bay up to April 27, and San Quintín Bay abundant in winter and a few throughout the summer (Bryant, 1889*b*, p. 273); San Ignacio Lagoon, April 12 and 18 (Huey, 1927*g*, pp. 240, 242); Turtle Bay in March, and Abreojos Point in April (Kaeding, 1905, p. 110); Navidad Island in midwinter (Lamb, 1927*a*, p. 69); San Quintín Bay in July (Howell, 1911, p. 152); Abreojos Point, July 31, and San Quintín, common August 14 (Anthony, 1925, p. 292); San Felipe Bay in spring (Huey, 1927*d*, p. 22); lower Colorado River, common in December (Price, 1899, p. 91); at mouth of Hardy River in February (Stone and Rhoads, 1905, p. 681). The Museum of Vertebrate Zoology contains specimens as follows: San Ramón, mouth of Santo Domingo River, December 15, 1925; San Felipe, on the Gulf, April 6 and 9, 1926.

Heteroscelus incanus (Gmelin)

Wandering Tattler

Present in varying numbers, often common, in all months of the year along the entire Pacific side of the peninsula; less frequent on Gulf side. Over-summering birds are, of course, non-breeders. First recorded by Belding (1883*a*, p. 532), from Cedros Island, whence also reported by Bryant (1886, p. 63, under the name *Heteractitis incanus*) and by several subsequent writers. There are but three records, so far, from the Gulf side: Espíritu Santo Island, "seen once," November 6, 1923 (Lamb, 1927*b*, p. 156); San Felipe, a few seen April 17 to 23, 1926 (Huey, 1927*d*, p. 22); laguna of Salton River, close to United States boundary, specimens collected "April 27 to 28, 1894" (Mearns, 1907, p. 130) [a skin, with-

out data, but which Dr. Richmond thinks is one of these, is no. 133767, U. S. Nat. Mus.]. Has been reported, otherwise, from Guadalupe Island, by several writers beginning with Gaylord (1897a, p. 42); from San Benito Islands (Anthony, 1900a, p. 28, *et al.*); from Todos Santos, San Gerónimo, San Martín, San Roque, and Asunción islands (Kaeding, 1905, p. 110, *et al.*); from Natividad Island (Lamb, 1927a, p. 69); from Los Coronados Islands (Grinnell and Daggett, 1903, p. 33, *et al.*); and from San José del Cabo, in October (Brewster, 1902, p. 68).

***Actitis macularia* (Linnaeus)**

Spotted Sandpiper

Varyingly common as a winter visitant or transient at many points, both coastwise and interiorly, throughout the entire length of the territory. First recorded by Belding (1883b, pp. 545, 548, under the name *Tringoides macularius*), from San José del Cabo and the Cape region generally. Brewster (1902, p. 69) records it from San José del Cabo as common through September and up to October 26, from Carmen Island March 6, and from Triunfo April 8. Bryant (1889b, p. 273) reports it from Magdalena Bay, Ensenada, and San Rafael (east of Ensenada), at the latter place May 12. Other definite stations are: San Bartolomé Bay, La Paz, and Concepción Bay (Townsend, 1923, p. 11); San Ignacio, May 18 (a skin in Mus. Vert. Zool.); San Gerónimo Island (Kaeding, 1905, p. 110); Cedros Island (Thayer and Bangs, 1907b, p. 78, *et al.*); Los Coronados Islands (Grinnell and Daggett, 1903, p. 33, *et al.*); Magdalena Bay and north to San Martín Island (Anthony, 1925, p. 293); La Grulla, on Sierra San Pedro Mártir, May 14 (Anthony, 1893, p. 231); San Felipe, March 31 to April 23 (Huey, 1927d, p. 22, and Mus. Vert. Zool.); Colorado delta, "often seen" in February (Rhoads, 1905, p. 688); Hardy River and Volcano Lake, "common" in April (Murphy, 1917, p. 86); Colorado River twenty miles south of Pilot Knob, October 15 (specimen in Mus. Vert. Zool.).

***Numenius americanus* Bechstein**

Long-billed Curlew

Winter visitant or transient, varyingly, at many localities from one end of the territory to the other. First recorded by Belding (1883b, p. 545, under the name *Numenius longirostris*) from the Cape region. But long previously, Xantus had taken a specimen at Cape San Lucas, September 15, 1859 (Cooke, 1910, p. 72). Brewster (1902, p. 70) reports it as "common in February" at La Paz, and present at San José del Cabo "late in August and early in September." Bryant (1889b, p. 273) found it "rare" in the neighborhood of Magdalena Bay, but reports that Anthony had found it "abundant" along the northwestern coast in winter, indeed "fairly swarming" at San Quintín Bay. At the latter point, Anthony (1925, p. 293) has more recently seen the species on July 18, as a "left-over," he thinks, "from the spring migration." A skin is in the Museum of Vertebrate Zoology taken at San Ramón, December 28, 1925. Kaeding (1905, p. 110) reports it from Turtle Bay, April 14; Townsend (1923, p. 11) reports it from Abreojos Point, March 16, and Magdalena Bay, March 21; Huey (1927g, p. 242) reports it from San Ignacio Lagoon in April; and Lamb (1927a, p. 69) from Natividad Island, in midwinter. Price (1899, p. 91) found it "common" along the lower Colorado River in December; and Huey (1927d, p. 22) found it "sparingly" at San Felipe, on the Gulf, April 6 and later. Oberholser (1918c, pp. 188-95), in an attempt to define two races, *Numenius americanus americanus* and *Numenius americanus occidentalis*, records specimens (in about equal num-

bers of each) from most of the above-mentioned localities and, in addition, San Lázaro Mountains [near San José del Cabo], January. W. M. Pierce (MS) took specimens near Ensenada, February 1, 1926.

***Phaeopus hudsonicus* (Latham)**

Hudsonian Curlew

Common transient, appearing at suitable localities, chiefly coastwise, the entire length of the peninsula; a few, also, occur through all the winter months and the summer months, both. First reported by Belding (1883*b*, pp. 545, 547, under the name *Numenius hudsonicus*) from the Cape region; more exactly, from San José del Cabo, a large flock May 1. However, the species had been taken long previously, by Xantus at Cape San Lucas, September 21 [1859] (Sharpe, 1896, p. 754). Other recorded occurrences are: Magdalena Bay and San Quintín Bay (Bryant, 1889*b*, p. 274); San Quintín Bay, April and July (Howell, 1911, pp. 152, 211, and Anthony, 1925, p. 293); Santa Margarita Island, March (Townsend, 1923, p. 11); Natividad Island, April and midwinter (Thayer and Bangs, 1907*b*, p. 80, and Lamb, 1927*a*, p. 69); San Gerónimo Island, and China Point, 30 miles south of Todos Santos Islands, April (Willett, 1913, p. 22); Los Coronados Islands, August (Grinnell and Daggett, 1903, p. 33); San Gerónimo Island and Turtle Bay, March and April (Kaeding, 1905, p. 110); San Ignacio Lagoon, April 11 and 18 (Huey, 1927*g*, p. 242); La Paz in February and March, and San José del Cabo, August 29 to middle of September (Brewster, 1902, p. 70); San Felipe, March 31 into April (Huey, 1927*d*, p. 23, and Mus. Vert. Zool.); Hardy River, in the Colorado delta, in February (Rhoads, 1905, p. 688).

***Squatarola squatarola squatarola* (Linnaeus)**

Common Black-bellied Plover

Common spring and fall transient, locally; also a few remaining through the winter. First recorded by Streets (1877, p. 16, under the name *Squatarola helvetica*), from San Gerónimo Island. Subsequent definitely recorded occurrences are as follows: San Quintín Bay, "common as late as May 10" (Belding, 1883*a*, p. 528); Santa Margarita Island, "small flocks in March" (Bryant, 1889*b*, p. 274, under *Charadrius squatarola*); San José del Cabo, "a few" October 18 to November 9, and Loreto and Carmen Island, "rather common" in March (Brewster, 1902, p. 71, under *Squatarola squatarola*); San Gerónimo Island, March 15, and Turtle Bay, "quite common" April 14 (Kaeding, 1905, p. 110); San Gerónimo Island, "common" April 13-14 (Willett, 1913, p. 22); Abreojos Point, March 16 (Townsend, 1923, p. 11), and the same place, "a few" July 31 (Anthony, 1925, p. 293, under *Squatarola squatarola cynosuroides*); San Ignacio Lagoon, April 12 (Huey, 1927*g*, p. 240); Natividad Island, "several" in midwinter (Lamb, 1927*a*, p. 69); San Felipe, April 11 (Huey, 1927*d*, p. 23). A skin in Mus. Vert. Zool. was taken at the last named place, April 1, 1926.

***Pluvialis dominicus dominicus* (Müller)**

American Golden Plover

Rare fall transient. Known only from the record by Brewster (1902, p. 71, under the name *Charadrius dominicus*) of a specimen taken at San José del Cabo, October 18, 1887, by Frazer, who thought he "saw a few others about the same time."

***Oxyechus vociferus vociferus* (Linnaeus)**

Northern Killdeer

A common and generally distributed resident on suitable ground throughout the entire length of the territory, but almost altogether on the mainland—only two island records. First recorded by Baird (1859, p. 306, under the name *Aegialitis vociferus*) as taken at Cape San Lucas by Xantus, who also procured the eggs there May 9, 1860 (Cooke, 1910, p. 87). A few other selected, out of the many, records are as follows: Comondú and "every favorable watering place" from there to San Quintín (Bryant, 1889*b*, p. 274); top of Sierra de la Laguna, nesting (Brewster, 1902, p. 71); "all the meadows on top of" the Sierra San Pedro Mártir (Anthony, 1893, p. 231); San Felipe, April 12 (Huey, 1927*d*, p. 23); Colorado delta and vicinity of Mexicali, "abundant" (Murphy, 1917, p. 86); Natividad Island, "a flock . . . daily on the plain" in midwinter (Lamb, 1927*a*, p. 69); Todos Santos Islands, one seen January 16, 1927 (Lamb, MS). Specimens in the Museum of Vertebrate Zoology were obtained at San José, latitude 31°, October 25, 1925, and at Laguna Hanson, on the Sierra Juárez, October 14, 1926.

***Charadrius semipalmatus* Bonaparte**

Semipalmated Plover

Moderately common as a transient and winter visitant at widely scattered points nearly the whole length of the territory. First recorded by Belding (1883*a*, p. 528, under the name *Aegialites semipalmatus*) from San Quintín Bay, where "rare" between May 2 and 11. Bryant (1889*b*, p. 274) found a flock at Magdalena Bay, March 12, and reports that Belding had found the species "moderately common" near La Paz and that Anthony had found it "common" at San Quintín Bay. Brewster (1902, p. 72) reports Frazer to have found this plover "common at La Paz in February, at Carmen Island in March, and at San José del Cabo from August 23 to the latter part of October." Townsend (1923, p. 12) records it from Abreojos Point, March 16. Anthony (1925, p. 294) records a flock from Magdalena Bay, July 27; Lamb (1927*a*, p. 69) reports one bird seen at Natividad Island, December 20; and Huey (1927*d*, p. 23) gives the species as "rather uncommon" at San Felipe, April 8. There is a skin in Mus. Vert. Zool. taken at the last named place, April 6, 1926.

***Charadrius nivosus nivosus* (Cassin)**

Western Snowy Plover

Common resident locally of sandy seabeaches wherever such occur from one end of the territory to the other. Recorded first by Belding (1883*a*, pp. 528, 530, 1883*b*, p. 545, under the name *Aegialites alexandrinus nivosus*), from San Quintín Bay, Santa Rosalía Bay, and the Cape region. Some other stations of definitely recorded occurrence are: Santa Margarita Island (Bryant, 1889*b*, p. 274, under *Aegialitis nivosus*); Abreojos Point, Magdalena Bay, and Carmen Island (Townsend, 1923, p. 12, *et al.*); San José del Cabo and San José Island (Brewster, 1902, p. 72, *et al.*); San Gerónimo Island (Willett, 1913, p. 22); Scammons Lagoon (Bancroft, 1927*a*, p. 49); Natividad Island (Lamb, 1927*a*, p. 69); San Ignacio Lagoon (Bancroft, 1927*b*, p. 194); San Felipe Bay, on the Gulf (Huey, 1927*d*, p. 23). Two skins from the last given locality are in Mus. Vert. Zool., of dates April 4 and 5, 1926.

Pagolla wilsonia beldingi* Ridgway*Belding Wilson Plover**

Common resident, locally, of the southern half of the peninsula. Northernmost station of recorded occurrence on the Gulf side, San Lucas, latitude 27° 15' (two specimens in Mus. Vert. Zool., taken May 12, 1927); on the Pacific side, Scammons Lagoon (Bancroft, 1927a, p. 49). Reported first by Belding (1883b, p. 545, under the name *Ochthodromus wilsonius*) as "very common" in the Cape region. Other recorded stations are: San José del Cabo, La Paz, and Carmen Island (Brewster, 1902, p. 73, under the name *Aegialitis wilsonia*); La Paz, breeding (Thayer, 1909a, p. 11); San Ignacio Lagoon (Bancroft, 1927b, p. 194); Abreojos Point (Kaeding, 1905, p. 110); Cape San Lucas (Baird, Brewer and Ridgway, 1884, I, p. 169). The subspecies was newly described by Ridgway (1919, p. 112) under the name *Pagolla wilsonia beldingi*, with type [no. 86424 in U. S. Nat. Mus.] from La Paz, collected by Lyman Belding, December 21, 1881.

Eupoda montana* (J. K. Townsend)*Mountain Plover**

Fairly common winter visitant to the upland plains, chiefly in the northwestern section of the territory; two cases of occurrence far to the southward, on Natividad Island and at La Paz. First recorded by Bryant (1889b, p. 275, under the name *Aegialitis montana*), who cites Anthony as having "met with a large flock on the open plains above San Telmo (altitude 800 ft.), in the winter of 1888-89," and Belding as having "often met with them in winter at Tia Juana." All the other published occurrences known to me are: La Paz, December 26, a specimen taken by A. Forrer (Sharpe, 1896, p. 242, under *Podasocys montanus*); Natividad Island, a flock December 22 and one bird January 9 (Lamb, 1927a, p. 69); plain near Rosarito Beach, 18 miles south of the U. S. boundary, a band February 18, 1925 (Huey, 1926, p. 351). The Museum of Vertebrate Zoology contains specimens taken by C. C. Lamb in El Valle de la Trinidad, 2500 feet altitude, November 24 and December 5, 1926. W. M. Pierce (MS) reports seeing a small company on the plains near San Telmo, December 23, 1927.

Aphriza virgata* (Gmelin)*Surf-bird**

Common but seemingly irregular migrant, with some individuals possibly remaining clear through the winter. The first ascription I can find is a vague one, simply to "Lower California," of a specimen in the British Museum (Sharpe, 1896, p. 739). The next one is definite enough: San Gerónimo Island, March 15, Turtle Bay, April 14, and Abreojos Point, April 19 [in 1897], "quite common" in small flocks (Kaeding, 1905, p. 111). Willett (1913, p. 22) reports two specimens from San Gerónimo Island, April 13, 1912. Townsend (1923, p. 12) records the species from Abreojos Point, March 16, and from San Josef Island, March 31 in 1911; "twenty or more were seen" at the latter place. Huey (1927d, p. 24) reports flocks, some of them comprising "up to 800 individuals," as present at San Felipe, on the Gulf, March 22 to April 24, 1926. From this same locality the Museum of Vertebrate Zoology has obtained a series of specimens taken by C. C. Lamb, March 31 to April 17, 1926.

Arenaria interpres morinella* (Linnaeus)*Ruddy Turnstone**

Fairly common spring and fall migrant; a few also wintering. Recorded first by Bryant (1889b, p. 275, under the name *Arenaria interpres*) who found it on Magdalena and Santa Margarita islands in February and March, and who reports Anthony to have taken the species in April at San Ysidro (about lat. 31° 17'). Brewster (1902, p. 74, under *Arenaria morinella*) reports the species from Carmen Island, where "common" March 12, and from San José del Cabo, "a few" between August 31 and October 21. Kaeding (1905, p. 111) found it "quite common" on San Gerónimo Island, March 15; and Willett (1913, p. 22) found it "common" on the same island the middle of April. Anthony (1925, p. 294) saw a flock at Abreojos Point [July 31]; Lamb (1927a, p. 70) took specimens at Natividad Island in midwinter; and Huey (1927g, p. 240) saw the species at San Ignacio Lagoon, April 12.

Arenaria melanocephala* (Vigors)*Black Turnstone**

Common winter visitant and transient on rocky shores practically the whole length of the peninsula; most plentiful on the Pacific side northerly. First reported by Streets (1877, p. 17, under the name *Strepsilas interpres melanocephalus*) from San Gerónimo Island. Subsequent reports are numerous, involving the following additional localities: Guadalupe Island (Anthony, 1925, p. 294); Los Coronados Islands (Grinnell and Daggett, 1903, p. 33, and other writers); near Monument 258, at U. S. boundary (specimen in Mus. Vert. Zool. taken December 29, 1927); Todos Santos Islands (Howell, 1912, p. 189, *et al.*); San Martín and Santa Margarita islands (Bryant, 1889b, p. 275, *et al.*); San Martín Island (skins in Mus. Vert. Zool. taken July 10 and 13, 1925); Cedros and Natividad islands (Thayer and Bangs, 1907b, pp. 78, 80, *et al.*); San Roque Island and Abreojos Point (Townsend, 1923, p. 12); La Paz and Loreto (Lamb, 1925d, p. 117); Consag Rock, off San Felipe (van Rossem, MS); San Felipe (Huey, 1927d, p. 24). A mistake as regards Lower California is "San Miguel" Island (Ridgway, 1919, p. 56).

Haematopus palliatus frazari* Brewster*Frazar Oyster-catcher**

Common resident of suitable parts of both coasts of the peninsula for nearly its entire length, the nearby islands, of course, included. Most numerous southerly. First recorded by Ridgway (*in* Belding, 1883a, p. 527, under the name *Haematopus palliatus*) from Los Coronados Islands; a specimen taken there by Belding, May 17, 1881. Belding, later, himself (1883c, p. 351) records the species from La Paz. The race was newly described by Brewster (1888a, p. 84) under the name *Haematopus frazari*, with type [now no. 214135 in Mus. Comp. Zool.] from Carmen Island, taken by M. A. Frazar, March 6, 1887. Gifford (1913, pp. 47-53) records specimens from San Martín, San Gerónimo, the San Benito, and Cedros islands under the name *Haematopus galapagensis*, claiming *frazari* and *galapagensis* to be "one and the same species." Murphy (1925, p. 9) indicates the relationships within the group much more satisfactorily, it seems to me, by

placing *frazari* and *galapagensis* both as subspecies of the species *palliatu*s. Other stations of occurrence for *frazari* not mentioned above are: San Quintín Bay, Magdalena Bay, and Santa Margarita Island (Bryant, 1889*b*, p. 275); Concepción Bay (Townsend, 1890, p. 138); Natividad Island, breeding, as also near La Paz (Thayer, 1909*c*, p. 188); Scammons Lagoon, breeding (Baneroff, 1927*a*, p. 51); Pond Lagoon (Huey, 1927*g*, p. 243); San Josef, Santa Catalina and Ángel de la Guardia islands, and Agua Verde Bay (Townsend, 1923, p. 12); Santa Inez and Partida islands, nesting, and taken on Mejía Island (Mailliard, 1923, pp. 446, 450, 452, 454); Partida and San Luís islands, breeding (van Rossem, MS); Todos Santos Islands (Howell, 1912, p. 189); San Roque Island, Asunción Island, etc., breeding (Kaeding, 1905, p. 111); Cerralvo and Espíritu Santo islands (Ridgway, 1919, p. 38); Abreojos Point (Cooke, 1910, p. 99). The Museum of Vertebrate Zoology contains a specimen taken on one of Los Coronados Islands, August 6, 1902.

***Haematopus bachmani* Audubon**

Black Oyster-catcher

Common resident on the Pacific coast of the peninsula and on the adjacent islands, north of latitude 27°. The ascription to La Paz (Bryant, 1889*b*, p. 276) is the only record from the Cape district as well as from the Gulf, so must be given close scrutiny. Bryant says it was "seen" there by Belding; but Belding himself nowhere that I can find so gives it, though he does record it from Los Coronados Islands on the Pacific side (Belding, 1883*a*, p. 528, under the name *Haematopus niger*). If this ascription, then, be considered doubtful, at least until further developments, the southernmost station established for the species is Abreojos Point, about 26° 40' (Kaeding, 1905, p. 111). Furthermore, the same author (Kaeding) records it as breeding "abundantly" on San Roque, Asunción, and Natividad islands, within one degree north of Abreojos Point; so that the implication (Ridgway, 1919, p. 41) that the species is migratory southerly is unsupported by the facts. The first record of this species from Lower California is by Streets (1877, p. 17), from San Martín Island. Other stations of occurrence not mentioned above are: San Gerónimo and the San Benito islands (Anthony, 1900*a*, p. 28, and Kaeding, *loc. cit.*); Cedros Island (skin in Mus. Vert. Zool. taken July 27, 1925); Todos Santos Islands (Howell, 1912, p. 189); San Quintín Bay (Howell, 1911, p. 152). Hybridization of this species with *frazari* has been suggested by several writers beginning with Willett (1913, p. 22). Because of this hybridization, or, possibly, integradation, Bancroft (1927*a*, p. 53) goes so far as to suggest emending the name to *Haematopus palliatu*s *bachmani*.

***Oreortyx picta confinis* Anthony**

San Pedro Mártir Mountain Quail

Common resident of the Sierra Juárez and the Sierra San Pedro Mártir. Altitudinal range, 2500 to 9000 feet, but greatest numbers encountered from 4000 to 7000. Life zone, chiefly Transition, in the chaparral association. Southernmost known station, near vicinity of Misión San Pedro Mártir, about latitude 30° 40' (Mus. Vert. Zool.). The species was first authentically recorded from the territory, and the subspecies newly described [type, now no. 20930 in Carnegie Mus., from Sierra San Pedro Mártir, taken April 25, 1889], by Anthony (1889*a*, p. 74). Several previous records, beginning apparently with Baird, Brewer and

Ridgway (1874, III, p. 476, under the name *Oreortyx pictus*), give the species as occurring south to "Cape St. Lucas." In some, Xantus is said to have collected it there. A specimen, which I have examined, and which may have been the basis of this San Lucas ascription, is no. 42267, Mus. Comp. Zool., with label reading "O. pictus. Douglas. ♂ | Sierra S^a Lazaro, L. Cal. || Collection of H. Bryant. | No. 984." But this is an extreme example of the race *O. p. palmeri*, hence not from anywhere in Lower California at all. At any rate, there has never been any confirmation of that early Cape San Lucas ascription (see Ridgway, in Belding, 1883b, p. 533, and Belding, 1883c, p. 346, both references under the name *Oreortyx picta plumifera*). The most extreme manifestation of the characters of the race *confinis* is shown in birds from the Sierra San Pedro Mártir; birds from north toward the United States boundary, for example, from Los Pozos, in the northern Sierra Juárez, are somewhat intermediate toward *O. p. picta* (see Oberholser, 1923a, p. 84). The series of *confinis* in the Museum of Vertebrate Zoology comes from the following localities: Santa Rosa Flats, near Misión San Pedro Mártir; Vallecitos, 7500 to 8500 feet; La Grulla, 7000 to 7500 feet; Laguna Hanson, 5200 feet; Los Pozos, 4200 feet; Las Cruces, 2600 feet, 20 miles east of Ensenada.

Lophortyx californica vallicola (Ridgway)

Valley California Quail

Common resident of the lower Pacific slope of the extreme northern end of Lower California, north of about latitude 32°. Occurs also on Los Coronados Islands (Howell, 1917, p. 52), between which and the opposite mainland the birds are said to fly back and forth (Nelson, 1921, p. 85). Howell (*loc. cit.*) thinks the quail were originally planted on those islands for shooting purposes. The first formal record applying to any locality within the Lower Californian range of this race as here restricted is Belding's (1890, p. 12, under the name *Callipepla californica vallicola*), from Tijuana. Specimens which I think best referable to *vallicola* (rather than to *plumbea*) are contained in the Museum of Vertebrate Zoology from five miles south of Monument 258 and from the south end of Valle de las Palmas.

Lophortyx californica plumbea Grinnell

San Quintín California Quail

Abundant resident of the northwestern portion of the territory, roughly between latitudes 30° and 32°—practically as comprised in the San Quintín sub-faunal district. While the metropolis of the subspecies lies on the Pacific slope of the peninsula, colonies or pairs occur also to the eastward, in cañons at the east base of the Sierra San Pedro Mártir, and even at San Felipe, on the Gulf coast (Mus. Vert. Zool.). As regards life-zone, inhabits the Lower Sonoran, Upper Sonoran, and Transition, without any seeming choice. Associationally, adheres to an open or interrupted type of chaparral, especially as adjacent to springs or water-courses. Altitudinally, extends from sea level up to as high as 8800 feet, on the Sierra San Pedro Mártir. The first formal record for the territory, applying without any doubt to the present race, is that by Belding (1883a, p. 528, under the name *Lophortyx californica*), from San Quintín Bay. The present subspecies was newly named by Grinnell (1926d, p. 128), with type [no. 46206 in Mus. Vert. Zool.] taken by himself at San José, 2500 feet altitude, about latitude 31°, September 27, 1925. The series of skins in the Museum of

Vertebrate Zoology represents the following localities: Arroyo Nuevo York; Santo Domingo; San Ramón; Colnett; San Telmo; San José, 2500 feet; Valladares, 2700 feet; La Grulla, 7200 to 7500 feet; Vallecitos at 8000 feet; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir; San Felipe, on the Gulf; El Valle de la Trinidad, 2500 feet; Rancho Ojos Negros, 2200 feet; Las Cruces, 2600 feet; Laguna Hanson, 5200 feet; Los Pozos, 4200 feet; Nachoguero Valley,

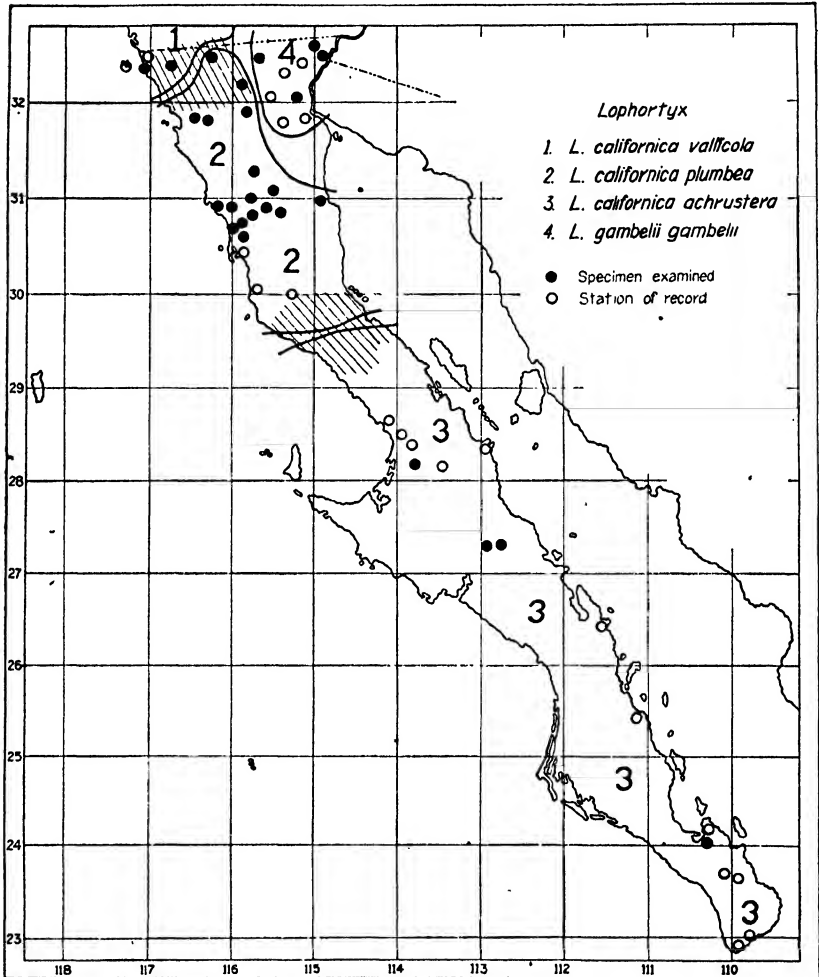


Fig. 4. Distribution of certain Quails, genus *Lophortyx*, in Lower California.
Intergradation between races shown by shading.

3400 feet. Specimens from the northward, north from the northern end of the Sierra Juárez (Los Pozos and Nachoguero Valley), show slight departures from the characters of typical *plumbea*, being intermediate toward *vallicola*. Other names which have been applied to the race now called *plumbea* are: *Callipepla californica vallicola* and *Lophortyx californica vallicola*.

Lophortyx californica achrustera Peters

San Lucas California Quail

Common resident of the Cape district and thence northward over at least the southern half of the peninsula. Enough stations of occurrence are on record to warrant the belief that the distribution of quail is practically continuous all the way up the peninsula, but material is lacking to show just where intergradation between the races *achrustera* and *plumbea* takes place. I will assume this to be between latitudes 28° and 30°. The present subspecies was newly named by Peters (1923, p. 79), with type [no. 218093, Mus. Comp. Zool.] from La Paz, where taken by M. A. Frazar, February 14, 1887. The species, and this race of it, was first formally recorded from Lower California by Baird (1859, p. 305, under the name *Lophortyx californicus*) as taken by Xantus at Cape San Lucas. Brewster (1902, p. 76, under *Lophortyx californicus vallicola*) gives an account of the status of the present race in the Cape district, including the information that it is seemingly restricted to the lowlands, hence to the Subtropical and Lower Sonoran life-zones. To the northward, Bryant (1889b, p. 276, under *Callipepla californica vallicola*) records the "Valley Partridge" from Calmallí [lat. 28° 15']; and Thayer and Bangs (1907c, p. 136) record it from Rosarito and vicinity, a little farther north. Townsend (1923, p. 13) records it as common along the Gulf coast north to Agua Verde Bay; and Mailliard (1923, p. 454) reports it additionally from Santa Antonita Point and San Francisquito Bay. The Museum of Vertebrate Zoology contains specimens from the following localities: La Paz; San Ignacio and 25 miles east of San Ignacio; Rancho Mesquital, 33 miles west of Calmallí. There is no record of quail from any of the islands, save of *vallicola* from Los Coronados, at the extreme north end of the territory.

Lophortyx gambelii gambelii Gambel

Western Gambel Quail

Abundant resident of riparian brushlands in the Colorado delta; also of brushy territory along and within the eastern foothills of the mountains to the westward of the delta. Life-zone, Lower Sonoran. Southernmost recorded station of occurrence, Tres Pozos [about lat. 31° 53'], and westernmost, west margin of Pattie Basin (Murphy, 1917, pp. 86-87). First definitely recorded by Price (1899, p. 91, under the name *Callipepla gambeli*) as abundant along the lower Colorado River down to within about ten miles of its mouth. Specimens are in the Museum of Vertebrate Zoology from: El Major, on the Hardy River; Colorado River twenty miles south of Pilot Knob; Alamo River, twenty miles southwest of Pilot Knob; Las Palmas Cañon, west side Laguna Salada. There is one much more southerly ascription of this quail, to "the western side of the peninsula, about lat. 30° N," where Bryant (1889b, p. 277) states that "a few pairs with small young were seen," presumably by himself. But no specimens nor subsequent reports are extant from there or elsewhere than the Colorado delta region, as above.

Columba fasciata fasciata Say

Northern Band-tailed Pigeon

Fairly common and probably resident, at least in some years, at the north, chiefly on the western flanks of the Sierra San Pedro Mártir and Sierra Juárez. Localities of actual capture are: San Antonio Ranch, 2100 feet altitude, on Santo Domingo River, in April, 1925, and Concepción, 6000 feet, in November, 1925,

in the former mountains (Grinnell and Lamb, 1927, p. 124, specimens in Mus. Vert. Zool.); La Joya [La Jolla], on Valladares Creek, in September, 1926 (Huey, 1927a, p. 153). Observed in considerable numbers at Laguna Hanson in the Sierra Juárez, in October, 1926, at San Pablo [about lat. 31° 35'], in November, 1926, and in vicinity of Guadalupe Valley [lat. 32°], in January, 1927 (C. C. Lamb, MS). A single individual reported as seen near Santo Tomás [25 miles southeast of Ensenada], April 28, 1925 (Huey, 1926, p. 352).

***Columba fasciata vioscae* Brewster**

Viosca Band-tailed Pigeon

Known only from the Cape district south of latitude 23° 45', where common in the mountain mass designated variously as the Victoria Mountains, the Sierra de la Laguna, and the Cape Mountains. Breeds on the upper parts of those mountains, chiefly in the oak belt (Upper Sonoran life-zone), and at times visits the surrounding foothill territory (Lamb, 1926, p. 262). The supposition that any or all the birds leave the peninsula in winter (Brewster, 1902, p. 77) has no recent evidence in its favor (Lamb, *loc. cit.*). The species was first definitely recorded from Lower California by Ridgway (*in* Belding, 1883b, p. 533, under the name *Columba fasciata*) as taken by Xantus in 1859 at Cape San Lucas and Miraflores. The subspecies was newly described by Brewster (1888a, p. 86), with type [now no. 214138 in Mus. Comp. Zool.] from La Laguna, taken by M. A. Frazar, May 30, 1887.

***Zenaidura macroura marginella* (Woodhouse)**

Western Mourning Dove

Common throughout the year, one place or another, the entire length of the territory; but most numerous at the north in spring and summer, while at the extreme south (in the Cape district), mainly, if not altogether, a winter visitant. Local abundance controlled chiefly by accessibility of fresh water. The southernmost positive record of breeding is Comondú, latitude 26° (Bryant, 1889b, p. 277, under the name *Zenaidura macroura*). Recorded first by Baird, Brewer and Ridgway (1874, III, p. 384, under *Zenaidura carolinensis*) from Cape San Lucas, as taken there by Xantus. Has been found on certain of the islands, as follows: Todos Santos Islands, May 29 (Van Denburgh, 1924, p. 69); Cedros Island, April, and July 22, breeding (Thayer and Bangs, 1907b, p. 78, and Anthony, 1925, p. 294). Some other of the many stations of record are: New River and near Pattie Basin, April (Murphy, 1917, p. 87); mouth of Esperanza Cañon, east base of Sierra San Pedro Mártir, June (Nelson, 1921, p. 17); San Quintín Bay, April and July (Howell, 1911, p. 152, under *Zenaidura macroura carolinensis*); San Fernando (Anthony, 1895d, p. 137); Rosario and Santana (Thayer and Bangs, 1907c, p. 136); Mulegé (Townsend, 1923, p. 13). Specimens in the Museum of Vertebrate Zoology were obtained at the following localities: El Valle de la Trinidad, 2500 feet, December 9; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir, May 20 and June 4; San José, 2500 feet, lat. 31°, May 6 and October 19; Santo Domingo, lat. 30° 45', December 16; Colorado River, twenty miles south of Pilot Knob, October 22; Alamo River, twenty miles southwest of Pilot Knob, January 20; Colorado River at lat. 32° 15', March 1.

***Melopelia asiatica mearnsi* Ridgway**

Western White-winged Dove

Common, even "abundant," resident of the Cape district; also present north from there, less regularly and commonly, to about latitude 30° on the Pacific side of the peninsula, and along the east side clear to the Colorado delta. First recorded by Baird (1859, p. 305, under the name *Melopelia leucoptera*), as taken by Xantus at Cape San Lucas. Some of the more important record-stations, beginning at the northwest, are as follows: San José, 2500 feet, latitude 31°, October 1 (Huey, 1927a, p. 153); Santo Domingo, near lat. 30° 45', sporadically "abundant" in the fall (Huey, 1926, p. 352, under *Melopelia asiatica trudeaui*); Esperanza Cañon, east base of Sierra San Pedro Mártir, "swarms" in June (Nelson, 1921, p. 17); San Fernando, "rather common," and Comondú, "abundant" and breeding (Bryant, 1889b, p. 277); Santana, March (Thayer and Bangs, 1907c, p. 136); Las Animas Bay [breeding], Carmen Island, Agua Verde Bay [breeding], and San Josef Island (Mailliard, 1923, pp. 451, 452, 454); La Paz, Triunfo, Sierra de la Laguna, San José del Cabo, and other points in the Cape district, resident (Baird, Brewer and Ridgway, 1874, III, pp. 376, 378; Brewster, 1902, p. 79; Thayer, 1909a, p. 11, under *Melopelia asiatica*; Kaedung, 1905, p. 111; Townsend, 1923, p. 13). The series of specimens in the Museum of Vertebrate Zoology furnishes the following data: San Ignacio, April 11 to May 3; El Cajón Cañon, 2300 to 3200 feet, east base Sierra San Pedro Mártir, May 16 to June 3; Las Palmas Cañon, west side Laguna Salada, November 4.

***Chamaepelia passerina pallescens* Baird**

Mexican Ground Dove

Common resident of the Cape district. Occurs also thence north clear to the Colorado delta, but only at scattered favorable localities, or sporadically; not reported from the Pacific slope north of about latitude 30°. The only island station is Santa Margarita, where, however, apparently only a mid-winter straggler (Bryant, 1889b, p. 278, under the name *Columbigallina passerina pallescens*). Other stations of known occurrence, beginning at the north, are: Colorado River, "a few miles south of Yuma," two or three seen November 27 and December 13 (Price, 1899, p. 91); near Mexicali, "abundant" in January (Bancroft, 1922, p. 98); Álamo River, twenty miles southwest of Pilot Knob (skin in Mus. Vert. Zool. taken January 21); Las Palmas Cañon, west side Laguna Salada (skin in Mus. Vert. Zool. taken November 7); a few miles east of El Rosario, "breeding commonly" (Huey, 1926, p. 352); Santana, March (Thayer and Bangs, 1907c, p. 136); San Ignacio and near El Potrero (Nelson, 1921, pp. 34, 36); San Ignacio (series of skins in Mus. Vert. Zool., taken April 12 to May 7); Comondú (Bryant, 1889b, p. 278); Mulegé (Townsend, 1923, p. 13); La Paz, San José del Cabo, and other localities in the Cape district (Baird, Brewer and Ridgway, 1874, III, pp. 390, 392; Bryant, 1891, p. 188; Brewster, 1902, p. 80; and other authors). First authentically recorded from the territory, and the subspecies newly named, by Baird (1859, pp. 301, 305), from specimens taken by Xantus at Cape San Lucas; the type is no. 13013, U. S. Nat. Mus., taken in May, 1859 (*vide* C. W. Richmond). An earlier ascription is by Baird (1858, pp. 606-607, under *Chamaepelia passerina*), who cites a specimen from "La Paz, L. Cal." But this "La Paz," I think, was the old immigrant stage station of that name, on the Colorado River, near Ehrenberg, Arizona! For account of systematic status, see Todd (1913, pp. 534-540, 594).

Gymnogyps californianus (Shaw)

California Condor

At one time a common resident of the northwestern portion of Lower California north of about latitude 30° and west of the western edge of the Colorado desert. Still present in small numbers in the Sierra Juárez and Sierra San Pedro Mártir. Reported first by Bryant (1889*b*, p. 278, under the name *Pseudogryphus californianus*) as having been observed by A. W. Anthony "at several places, from sea level to an altitude of 11,000 [*sic*] feet" [in the Sierra San Pedro Mártir]. All the other original records known to me are: "Guadalupe Valley, forty miles south of Ensenada and near the coast," dead bird found (Anthony, 1893, p. 233); dead bird found in 1887 on "barren hills east of El Rosario, about 30° north," the southernmost station of known occurrence (Anthony, 1893, p. 233, and 1895*d*, p. 137); seen "at one time" in San Rafael Valley, east of Ensenada (Anthony, 1893, p. 233); common and "seen daily" on the San Pedro Mártir in May, 1893 (Anthony, 1893, p. 233); "one or more pairs" bred, previous to 1890, "near Mr. Crosswaith's ranch about 60 miles south of San Diego" (Belding, 1890, p. 24); Santa Rosa Cañon and Santa Rosa Valley, 7000 feet, in southern part of Sierra San Pedro Mártir, "rather common" and "about a dozen" seen at one time, in July, 1905 (Nelson, 1921, p. 22); egg from San Pablo Peak, 4200[1] feet [near lat. 31° 30'], taken March 15 [year?] (Swann, 1924, pp. 19-21); seen on Sierra Juárez in July, 1924, and on Sierra San Pedro Mártir in June, 1923, one bird in each case (Huey, 1926, p. 352); "one seen at Mount Major camp," east base of Cocopah Mountains, edge of Colorado delta, in February, 1905 (Rhoads, 1905, p. 689).

Cathartes aura septentrionalis Wied

Northern Turkey Vulture

Varyingly common, even "abundant," as a resident over the entire mainland of the peninsula; occurs also on many of the islands, at least as a vagrant. In the northern end of the territory, north of about latitude 30°, much less numerous in winter than in summer and, at the former season, restricted to the lower levels; in summer, ranges all over the Sierra San Pedro Mártir and other high mountains. First recorded by Baird, Brewer and Ridgway (1874, III, p. 345, under the name *Rhinogryphus aura*), doubtless from specimens taken in the Cape district by Xantus. Some island records are: Cedros Island (Belding, 1883*a*, p. 531, under *Cathartes aura*, and several later authors); Santa Margarita and Magdalena islands (Bryant, 1889*b*, p. 278, *et al.*); San Martín Island (Kaeding, 1905, p. 111, *et al.*); Natividad Island (Lamb, 1927*a*, p. 70); and, in the Gulf, Coronados and San Francisco islands (Mailliard, 1923, p. 455). A skin in the Museum of Vertebrate Zoology was taken at Santo Domingo, lat. 30° 45', December 8, 1925, and a skeleton at San Felipe, on the Gulf, April 11, 1926. Records otherwise are widely distributed both geographically and seasonally, in accordance with the above general statement, and need not be cited specifically.

Elanus leucurus majusculus Bangs and Penard

North American White-tailed Kite

Known authentically only from the northwestern section of the territory, where probably resident, at least formerly, though not common. Records are as follows: "Seen on several occasions by Mr. Anthony along the coast near Cape Colnett in late fall" (Bryant, 1889*b*, p. 278, under the name *Elanus leucurus*).

One bird seen, June 12, 1894, on the San Carlos mesa, about lat. 29° 45', south of San Fernando (Anthony, 1895*d*, p. 137); this is the southernmost reported station of occurrence. A record from the Colorado delta region is not convincing: "Seen twice along the Hardy" in February (Rhoads, 1905, p. 689).

***Circus hudsonius* (Linnaeus)**

Marsh Hawk

Fairly common resident at low altitudes on the Pacific side of the northwestern section of the territory. Breeds south as far as El Rosario, latitude 30° (Huey, 1926, p. 352). Occurs widely elsewhere, either as a winter visitant or a transient, south clear to the southern tip of the peninsula. First recorded by Belding (1883*b*, p. 544) as "common" [in winter] in the Cape region. Other stations of occurrence, beginning at the north, are: near Tijuana, nest and eggs March 23, 1884 (Belding, 1890, p. 28); Los Coronados Islands, April 6 (van Rossem, 1909, p. 208); Colorado delta, "frequent" in February (Rhoads, 1905, p. 689); near Mexicali in January (Bancroft, 1922, p. 98); San José, latitude 31° (skin in Mus. Vert. Zool. taken September 29, 1925); San Telmo (skin in Mus. Vert. Zool. taken March 30, 1925); Colnett Bay and San Martín Island in April (Willett, 1913, p. 22); Cape Colnett and San Ramón, nesting (Bryant, 1889*b*, p. 278); Natividad Island in December (Lamb, 1927*a*, p. 70); Magdalena Island in February, and lower Purísima Cañon [about lat. 26°], April 5 (Bryant, *loc. cit.*); San José del Cabo, arriving September 5, Santiago, and Sierra de la Laguna, in winter (Brewster, 1902, p. 81).

***Accipiter velox* (Wilson)**

Sharp-shinned Hawk

Winter visitant scatteringly south through the entire length of the peninsula. First recorded by Baird, Brewer and Ridgway (1874, III, p. 226, under the name *Nisus fuscus*) from San Nicolás, near Cape San Lucas, based on a specimen taken doubtless by Xantus. Belding (1883*b*, p. 544, under *Accipiter fuscus*) reports the species as "rare" in the Cape region. Frazar (Brewster, 1902, p. 81) found it more commonly, at various places from San José del Cabo to the summit of the Sierra de la Laguna, from October 31 to "some time in March." Bryant (1889*b*, p. 279) saw one on Santa Margarita Island, March 1, and another in March at San Juan [near lat. 26°]. Thayer and Bangs (1907*c*, p. 136, under the name *Accipiter velox pacificus*) record a specimen taken at Rosario, latitude 30°, November 19. Price (1899, p. 91) and Stone and Rhoads (1905, p. 681) both record this species from the Colorado delta region in winter. According to Bryant (*loc. cit.*), Anthony at one time considered it "resident of the region north of San Fernando"; but Anthony, in his own lists published later, does not include this hawk. The Museum of Vertebrate Zoology contains specimens taken at San José, 2500 feet, September 27, 1925, and on the Colorado River, twenty miles south of Pilot Knob, October 15, 1927.

***Accipiter cooperii* (Bonaparte)**

Cooper Hawk

Common winter visitant, or at least transient, throughout the entire length of the peninsula. Also remaining through the summer, that is, resident, sparingly north of about latitude 30°. Recorded first by Ridgway (in Belding, 1883*b*, p. 533) from specimens taken by Xantus at Cape San Lucas, October 26-31, and at San Nicolás [near-by] in October [of 1859 or 1860]. Belding (1883*c*, p. 351)

reported the species as "rare" at La Paz or south of there; Brewster (1902, p. 82) reports Frazar to have found it at San José del Cabo "as early as October 14" and on the Sierra de la Laguna "as late as May 9"; and Townsend (1923, p. 13) records a specimen from Cape San Lucas, March 24. At the north, Thayer and Bangs (1907c, p. 136, under the name *Accipiter cooperii mexicanus*) record two from Rosario in November; Bendire (1892, p. 192) records it as breeding at Cape Colnett, probably on authority of Anthony; Huey (1926, p. 352) reports it from El Rosario in May, Santo Domingo in March, La Grulla Gun Club (near Ensenada) April 28, and Guadalupe [near lat. 32°], nest and young, May 31. Rhoads (1905, p. 689) saw several in the Colorado delta in February. Specimens with following data are contained in the Museum of Vertebrate Zoology: San José, 2500 feet, latitude 31°, October 23, 1925; Valladares, 2700 feet, April 20, 1925; La Grulla, 7200 feet, on Sierra San Pedro Mártir, May 22 and October 11, 1925; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir, May 20, 1926.

***Parabuteo unicinctus harrisi* (Audubon)**

Harris One-banded Hawk

Resident on the mainland throughout the entire length of the peninsula; common in the southern and central portions and in the Colorado delta, less frequent in the northwestern section. Not reported from any island. First recorded by Baird, Brewer and Ridgway (1874, III, p. 250) as taken by Xantus at Cape San Lucas. Subsequently reported as numerous and widely distributed in the Cape district (Belding, 1883b, pp. 544, 548, Brewster, 1902, p. 82, *et al.*). Records for so conspicuous a bird are numerous, and only a few are cited here. Centrally, recorded from San Jorge, San Juan and San Gregorio [about 26° lat.] (Bryant, 1889b, p. 279); from Rosarito and Santana [about lat. 28° 30'] (Thayer and Bangs, 1907c, p. 136); and from San Andrés ranch, near Playa María Bay (Nelson, 1921, p. 29). Some northern stations are: Colorado delta and Pattie Basin (Rhoads, 1905, p. 689, and Murphy, 1917, p. 88); 40 miles south of San Diego [California], specimen May 10, 1885 (Bryant, *loc. cit.*); Ensenada to El Rosario, San Fernando, San Quintín, and Sierra San Pedro Mártir up to 7000 feet (Anthony, 1893, p. 233, 1895d, p. 137, and 1925, p. 295); Santo Tomás, Santo Domingo, etc. (Huey, 1926, p. 352). The three skins in the Museum of Vertebrate Zoology were obtained at San Ramón, mouth of Santo Domingo River, December 15, 1925, at San Ignacio, May 4, 1927, and on the Colorado River, twenty miles south of Pilot Knob, October 22, 1927. References to Lower California have been cited under other names than the above: *Antenor unicinctus harrisi* (Ridgway, 1881, p. 79); *Buteo harrisi* (Salvin and Godman, 1900, p. 57).

***Buteo borealis calurus* Cassin**

Western Red-tailed Hawk

Common, even "abundant," resident practically throughout the peninsula; occurs also on several of the islands. Among the latter are: Guadalupe Island, where resident (Bryant, 1887a, p. 279, and most other visitors there); Santa Margarita Island (Bryant, 1889b, p. 280); Todos Santos Islands (Kaeding, 1905, p. 111); Natividad Island (Lamb, 1927a, p. 70). First recorded from Lower California by H. Bryant (1861, p. 111, under the name *Buteo montanus*), from Cape San Lucas. So many mainland stations of occurrence have been recorded for this hawk that detailed citations seem unnecessary here. It occurs from sea-level to the tops of the highest mountains. This is well demonstrated in the series belonging to the Museum of Vertebrate Zoology, which represents localities

as follows: Santo Domingo, lat. 30° 45'; La Grulla, 7200 to 7500 feet, Vallecitos at 8500 feet, and La Encantada, 7400 feet, on the Sierra San Pedro Mártir; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir; San Felipe, on the Gulf; Alamo River, in the Colorado delta twenty miles southwest of Pilot Knob. A supposed subspecies, *Buteo borealis lucasanus*, was described from Cape San Lucas, based on a Xantus-taken specimen [no. 16925 in U. S. Nat. Mus., of date September 15, 1859—*vide* Dr. C. W. Richmond], by Ridgway (*in* Baird, Brewer and Ridgway, 1874, III, pp. 258, 285). But its tenability has been effectually disproven by several writers, notably Brewster (1902, p. 83). The name had, by the way, been published two years previously to Ridgway's description (Coues, 1872, p. 216, as "*B[uteo]. lucasanus*"), though as a *nomen nudum*. A recent attempt to reinstate this form (Swann, 1926, p. 393) is not convincing.

***Buteo lineatus elegans* Cassin**

Red-bellied Red-shouldered Hawk

Rare resident in the northwestern portion of the territory. Authentic records very few, as follows: The first by Bryant (1889*b*, p. 280) of a pair found nesting by Belding at San Rafael [east of Ensenada]; the date of this nesting was May 12, 1885 (see Belding, 1890, p. 34). Anthony (1893, p. 234) says of this hawk: "Not seen this season [1893] south of Ensenada . . . ; seems to be confined chiefly to the creek bottoms where cottonwoods and sycamore growths afford it convenient nesting sites." A specimen taken at Rosario [lat. 30°] November 9 (Thayer and Bangs, 1907*c*, p. 136) furnishes the southernmost record to date. Rhoads (1905, p. 689) thought he saw "several" in the Colorado delta in February; doubtful. The matter credited to Anthony by Bryant (*loc. cit.*), and probably that by Bendire (1892, p. 227), really pertained to the Harris Hawk (see Anthony, *loc. cit.*). Salvin and Godman (1900, p. 67) cite this hawk from Lower California under the name *Buteo lineatus*.

***Buteo abbreviatus* Cabanis**

Zone-tailed Hawk

Resident locally but nowhere very common. Apparently at all numerous only at the north, in the San Pedro Mártir district. First recorded by Belding (1883*b*, p. 544) as "very rare" in the Cape region. Frazar saw what he felt confident was this species on a few occasions at San José del Cabo and Santiago (Brewster, 1902, p. 87). Lamb (1927*b*, p. 156) found it "rare" in the Cape district, recording it from El Valle and Todos Santos. Anthony found it nesting near La Grulla on the Sierra San Pedro Mártir, and has reported occasional birds elsewhere in the same vicinity (see Bryant, 1889*b*, p. 280, Bendire, 1892, p. 229, and Anthony, 1893, p. 234). Huey (1926, p. 353, and 1928*a*, p. 159) reports it from the last named locality and also from El Rayo and Laguna Hanson, in the Sierra Juárez, and from El Valle de la Trinidad. There are specimens in the Museum of Vertebrate Zoology from near Tijuana (see Grinnell, 1909, p. 69), from San Antonio Ranch, 2100 feet, on upper Santo Domingo River, and from San Ignacio.

***Buteo swainsoni* Bonaparte**

Swainson Hawk

Fairly common locally as a transient or summer visitant in the northern section of the territory. Actual records few, as follows: First, by Bryant (1889*b*, p. 280), as reported by Anthony from the coast belt west of the Sierra San Pedro Mártir, and by Belding, who shot a bird at Las Palmas, 40 miles southeast of San Diego

[California] May 10 [1885] (see Belding, 1890, p. 36). Anthony (1893, p. 234) considered this hawk a "common species [in spring] in all of the lower valleys" up to about 3000 feet altitude west of the Sierra San Pedro Mártir; and he records a specimen taken in Guadalupe Valley [lat. 32°, north of Ensenada] April 24, 1893. Huey (1926, p. 353) records a pair seen near Rosarito Beach [some 15 miles south of Tijuana], April 27, 1925, and another pair seen, with some evidence of nesting, ten miles south of Ensenada, April 28, 1925. Rhoads (1905, p. 689) supposed he saw "several" in February in the Colorado delta; but this is very doubtful.

***Buteo regalis* (Gray)**

Ferruginous Rough-legged Hawk

Occasional winter visitant south through the entire length of the peninsula. First recorded by Brewster (1902, p. 88, under the name *Archibuteo ferrugineus*) on the basis of two specimens obtained by Frazer on the summit of the Sierra de la Laguna, November 28, 1887. Huey (1926, p. 353) saw a bird eight miles south of Ensenada, February 18, 1925, and took two specimens at Santo Domingo [lat. 30° 45'], February 21 and 22, 1925. J. Grinnell (MS) saw one daily October 12-15, 1925, at 7200 feet altitude near La Grulla, on the Sierra San Pedro Mártir.

***Aquila chrysaetos* (Linnaeus)**

Golden Eagle

Fairly common resident in the northern section of the peninsula, north from about latitude 30°. First reported by Bryant (1889b, p. 281) citing Anthony as having found the species in the San Pedro Mártir region from the seacoast up to "11,000 feet." Then Anthony himself (1893, p. 234, and 1895, p. 138) recorded it as nesting at San Telmo, and as seen once near San Fernando; the latter is the southernmost record station to date. Huey (1926, p. 353) reports seeing a Golden Eagle at La Grulla, Sierra San Pedro Mártir, and another "on the north end of the San Quintín plain." In the Colorado delta, Price (1899, p. 91) reports seeing one in December on the bank of the Colorado River above Montague Island; and Rhoads (1905, p. 689) implies that he met with the species at "Mount Major" [east base of Cocopah Mountains]. In the Museum of Vertebrate Zoology is a skeleton of the Golden Eagle obtained near Laguna Hanson, 5200 feet, Sierra Juárez, October 21, 1926.

***Haliaeetus leucocephalus leucocephalus* (Linnaeus)**

Southern Bald Eagle

Scatteringly resident along both coasts and about certain of the nearby islands. First reported by Bryant (1889b, p. 281), who found a nesting pair on Santa Margarita Island and saw an adult on the "estero" north from Magdalena Bay. Other record stations on the Pacific side are: Cedros Island (Willett, 1913, p. 22); Todos Santos Islands, nesting (Kaeding, 1897, p. 109, and several subsequent writers); Guadalupe Cañon [north of Ensenada], nesting (Huey, 1927a, p. 153); Los Coronados Islands (Grinnell and Daggett, 1903, p. 33, and Stephens, 1921, p. 96). On the Gulf side: Espíritu Santo Island and mainland opposite Carmen Island, nesting (Brewster, 1902, p. 88); San Francisco Island, nesting (Thayer, 1909b, p. 143); Hardy River, Colorado delta, seen in February (Rhoads, 1905, p. 689). Also observed in October on the Sierra Juárez in the neighborhood of Laguna Hanson (Huey, *loc. cit.*).

Falco mexicanus Schlegel

Prairie Falcon

Probably fairly common and widely distributed throughout the entire length of the territory; but definite records are few. First reported by Baird, Brewer and Ridgway (1874, III, p. 124, under the name *Falco lanarius*, var. *polyagrus*) as taken by Xantus at San José del Cabo in January, 1860. Subsequently, Ridgway (in Belding, 1883b, p. 533, under *Hierofalco mexicanus*) records other Xantus-taken specimens from Miraflores and Cape San Lucas. Bryant (1889b, p. 281) records the species as nesting at San Estéban [lat. 27° 30']; also as seen at Comondú, on Santa Margarita Island, and on Guadalupe Island ("on two or three occasions" in 1886). Bancroft (1927b, p. 194) reports it nesting on San Luís Island [lat. 30° in the Gulf]. Huey (1926, p. 353, and 1927d, p. 25) reports seeing a bird at El Rosario, and collecting one at San Felipe. Specimens are in the Museum of Vertebrate Zoology from San Telmo, taken April 7, 1925, and from near Vallecitos at 7500 feet, on the Sierra San Pedro Mártir, June 10, 1926.

Falco peregrinus anatum Bonaparte

American Duck Hawk

Common resident, chiefly coastwise and around islands, along both sides of the peninsula its whole length. The more southerly occurrences appear to be mostly of vagrant or non-breeding birds. First recorded by Bryant (1889b, p. 281), who cites Anthony as having found the species nesting in the cliffs along the northwestern seacoast, San Carlos landing to San Quintín. According to Brewster (1902, p. 89), Frazer found it, in the Cape district, in February and March at La Paz and in October and November at San José del Cabo and Santiago. Some islands in the Gulf whence reported nesting are: Idefonso (Lamb, 1924, p. 63); Consag Rock and San Luís Islands [lat. 30°] (Bancroft, 1927b, p. 194). Pacific-side islands where nesting are: Los Coronados (Grinnell and Daggett, 1903, p. 33, under the name *Falco anatum anatum*, Howell, 1917, p. 56, and several other writers); San Gerónimo, the San Benito, and Natividad (McGregor, 1899d, p. 181, and other writers); San Roque (Huey, 1927f, p. 206); Cedros (Kaeding, 1905, p. 111, *et al.*); Todos Santos (Howell, 1912, p. 189, *et al.*). Some other stations of recorded occurrence are: San Martín Island (Willett, 1913, p. 22); Guadalupe Island (Gaylord, 1897a, p. 42, not quite certain); San Ignacio Lagoon (Huey, 1927g, p. 242); Lower California shore of Gulf below Montague Island (Price, 1899, p. 91); Coronados Islands, in the Gulf (Mailliard, 1923, p. 455); Laguna Hanson on Sierra Juárez, and La Grulla on Sierra San Pedro Mártir (Huey, 1926, p. 353).

Falco columbarius bendirei Swann

Western Pigeon Hawk

Sparingly winter visitant south clear to the southern extremity of the peninsula. First recorded by Belding (1883c, p. 351, under the name *Æsalon columbarius*) on the basis of a specimen taken at La Paz in January, 1883. Brewster (1902, p. 89, under *Falco columbarius*, and p. 90, under *Falco columbarius richardsonii*) records specimens taken by Frazer at San José del Cabo and Santiago, where observed September 17 to November 17, 1887. Huey (1926, p. 353) records a specimen from Santo Domingo [lat. 30° 45'] taken March 1, 1925. The three skins in the Museum of Vertebrate Zoology bear the following data: San Ramón, mouth of Santo Domingo River, March 18, 1925; El Valle de la Trinidad, 2500 feet, December 3, 1926; San Ignacio, April 19, 1927.

Falco sparverius phalaena (Lesson)

Desert Sparrow Hawk

Common resident widely over the northern end of the territory, south at least to about latitude 30°. Occurs also in numbers as a winter visitant or transient to the southward clear through the Cape district, thus invading the range of the southerly-resident race *peninsularis*. This duplication of wintering grounds at the south makes identification of birds observed uncertain, unless backed by specimens. The Sparrow Hawk of Guadalupe Island, breeding there, is definitely the Desert (Thayer and Bangs, 1908, p. 104, under the name *Cerchneis sparveria phalaena*; see also Gaylord, 1897a, p. 42, under *Falco sparverius deserticolus*, Bryant, 1887a, p. 280, and Thoburn, 1899, p. 278, under *Falco sparverius*). Cape district records unquestionably pertaining to *phalaena* are: Brewster (1902, p. 90), from San José del Cabo, September 17 to October 31, and Triunfo, December 22; Townsend (1923, p. 14), from San José del Cabo, March 26. Island records of Sparrow Hawks most likely, if not positively, of this race are: Los Coronados Islands (Osburn, 1909, p. 137); Todos Santos Islands (Kaeding, 1905, p. 134, and Van Denburgh, 1924, p. 70); West Benito Island, March 9 (Townsend, 1923, p. 14); Natividad Island, December (Lamb, 1927a, p. 70); Santa Margarita and Magdalena islands (Bryant, 1889b, p. 281). On the northern mainland this hawk is well known to be common in the Colorado delta, in the Sierra Juárez, in the Sierra San Pedro Mártir (to their summits, at least in summer), and in the Pacific coast district northward from the vicinity of San Fernando to the United States boundary. The series in the Museum of Vertebrate Zoology represents the following localities: Las Cruces, 20 miles east of Ensenada, January 6; Todos Santos Islands, January 12 and 14; five miles south of Monument 258, December 27 and 30; south end of Valle de las Palmas, January 7, 9, and 10; San José, 2500 feet, lat. 31°, May 9 and October 19 and 23; La Grulla, 7200 feet on Sierra San Pedro Mártir, May 21 and 24; Colorado River twenty miles south of Pilot Knob, October 13.

Falco sparverius peninsularis Mearns

San Lucas Sparrow Hawk

Common resident in the Cape district and thence northward to about 28° latitude. The northernmost recorded station of occurrence definitely for this race is Santana, about lat. 28° 40' (Thayer and Bangs, 1907c, p. 136, under the name *Cerchneis sparveria peninsularis*). Intergradation between the races *phalaena* and *peninsularis* probably takes place between latitudes 28° and 30°. What was undoubtedly this race was first recorded by Baird (1859, p. 302, under *Tinnunculus sparverius*) as taken by Xantus at Cape San Lucas. The subspecies *peninsularis* was newly described by Mearns (1892, p. 267), with type [no. 16930 in U. S. Nat. Mus.] a Xantus-taken bird from San José del Cabo, of date May, 1859 [*Adde* C. W. Richmond]. Other important records applying definitely to the present form are: Brewster (1902, p. 91), from Carmen Island, Triunfo, Santiago, San José del Rancho, and San José del Cabo; Townsend (1923, p. 14), from Cape San Lucas and Miraflores; Nelson (1921, pp. 120, 126), distribution in general. The record of Sparrow Hawks from Cerralvo and Espíritu Santo islands, in the lower Gulf (Nelson, 1921, pp. 91, 92) may also belong here. Specimens of *peninsularis* are in the Museum of Vertebrate Zoology from: La Paz, November 22 and December 12 and 13; San Lucas, lat. 27° 14', on the Gulf, May 10; San Ignacio, May 6; La Esperanza Rancho, 12 miles east of San Ignacio, May 15.

Since the above was written, Mr. C. C. Lamb has sent in to this Museum three diminutive Sparrow Hawks obtained October 14, 1927, on the Colorado River twenty miles south of Pilot Knob, January 21, 1928, on the Alamo River twenty miles southwest of Pilot Knob, and February 4, 1928, five miles east of Cerro Prieto. I am unable to distinguish these from Cape-district *peninsularis*. Whether northward vagrants of that race, or representatives of a resident "colony" of that race on the Colorado Desert, or curiously dwarfed individual variants of *phalaena*, is not now demonstrable.

***Polyborus cheriway auduboni* Cassin**

Audubon Caracara

Common, even "abundant," resident of the Cape district; thence northward in lesser numbers, but regularly, to about latitude 26°, north of which of only rare occurrence. First recorded by Baird, Brewer and Ridgway (1874, III, pp. 178, 180, under the name *Polyborus tharus*, var. *auduboni*) as obtained by Xantus at Cape San Lucas (see also Ridgway, 1876a, pp. 457-458, under *Polyborus cheriway*). Other published records are: San José del Cabo and elsewhere in the Cape district (Belding, 1883b, pp. 543, 547); Santa Margarita Island and Magdalena Bay (Bryant, 1889b, p. 282, Nelson, 1921, p. 90, Townsend, 1923, p. 14, and Anthony, 1925, p. 295); La Paz, San José del Rancho, and San José del Cabo (Brewster, 1902, p. 92). There are only five occurrences known to me north of latitude 26°: Santo Domingo [lat. 28° 15'], a pair (Bryant, 1889b, p. 282); San Ignacio, specimen (in Mus. Vert. Zool.) obtained by J. Elton Green, April 25, 1927; twenty miles south of Calmallí, seen April 7, 1927 (C. C. Lamb, MS); upper Hardy River, in the Colorado delta, two seen in February (Rhoads, 1905, p. 689); ten miles west of Pilot Knob and one mile south of United States boundary, specimen (in Mus. Vert. Zool.) taken by C. C. Lamb, and two other individuals seen, March 15, 1928.

***Polyborus lutosus* Ridgway**

Guadalupe Caracara

Restricted to Guadalupe Island, and formerly "abundant" there; now probably extinct. First recorded, and the species newly named, by Ridgway (1876a, p. 459) from specimens [type is no. 69984 in U. S. Nat. Mus., of date May 10, 1875] taken by Edward Palmer (see also Ridgway, 1876b, pp. 192-195). Apparently the very last, eight specimens, were taken by a collector in 1900 (Rothschild and Hartert, 1902, p. 404). However, there is evidence, though feeble, that the species existed up to 1913 (Swarth, 1913, p. 229). All the references that I know of, beside the above and that are not merely nominal or systematic, are as follows: Ridgway, 1877, pp. 60-65 (phylogeny); Bryant, 1887a, p. 281, and 1889b, p. 282 (already, by 1889, scarce, having been systematically killed on account of depredations among the goats!); Lucas, 1891, p. 219 (skeleton); Bendire, 1892, p. 318; Gaylord, 1897a, p. 42; Kaeding, 1905, p. 134; Thayer and Bangs, 1908, p. 106; Nelson, 1921, p. 95; Huey, 1924b, p. 581; Anthony, 1925, p. 295; Swann, 1925, p. 73, pls. 3, 4 (egg recorded as taken April 17, 1897).

***Pandion haliaëtus carolinensis* (Gmelin)**

American Osprey

Common resident coastwise both in the Gulf and along the Pacific side, including practically all the adjacent islands from which reports by any ornithologist have been made. First recorded by Baird, Brewer and Ridgway (1874, III,

pp. 185, 187) as taken by Xantus at Cape San Lucas. Subsequently reported by nearly everyone who has visited any part of the territory, with the result that there are, at this writing, over thirty published ascriptions besides numerous manuscript ones. Only a few will be cited here: "500 miles off Cape S. Lucas" (Sharpe, 1874, p. 451, under the name *Pandion haliaetus*); San Gerónimo Island, nesting (Streets, 1877, p. 16); Santa Margarita and Cedros islands, nesting (Bryant, 1894, p. 18); Guadalupe Island, specimen taken, the only reported occurrence there (Anthony, 1925, p. 295); San Benito and Cedros islands, nesting (Gaylord, 1897*d*, p. 131); San Martín and Santa Margarita islands, nesting (Bryant, 1889*b*, p. 283, and Willett, 1913, p. 22); San Roque Island, nesting (Huey, 1927*f*, p. 206); Scammon Lagoon, nesting (Bancroft, 1927*a*, p. 53); Carmen Island, nesting (Brewster, 1902, p. 92); San Francisco Island, nesting (Thayer, 1909*b*, p. 143); Ildefonso Island, nesting (Lamb, 1924, p. 63); San Luis and Angel de la Guardia islands, nesting (Mailliard, 1923, pp. 450, 455); San Felipe, nesting (Huey, 1927*d*, p. 26); Colorado delta at east base Cocopah Mountains, in February (Rhoads, 1905, p. 689). Two specimens are contained in the Museum of Vertebrate Zoology: San Martín Island, July 19, 1925; Cedros Island, July 22, 1925.

***Tyto alba pratincola* (Bonaparte)**

American Barn Owl

Resident widely from one end of the territory to the other, but common only in the northwestern coastal lowlands, north of about latitude 28°. First recorded by Ridgway (*in* Belding, 1883*b*, p. 533, under the name *Aluco flammeus americanus*) as taken by Xantus at San José del Cabo and Caduana, in the Cape district. That it is not common there is shown by Frazar's having found it only once, on the Sierra de la Laguna (Brewster, 1902, p. 92, under *Strix pratincola*). Bryant (1889*b*, p. 283) heard it once at Magdalena, and subsequently "at various places" north along his route to San Quintín. Thayer and Bangs (1907*c*, p. 137) record specimens from San Andrés [about lat. 28° 45'] and Rosario. Some other stations of reported occurrence are: Los Coronados Islands (van Rossem, 1909, p. 208, under *Aluco pratincola*); Todos Santos Islands, nesting (Howell, 1912, p. 190, and other writers); Colnett Bay and San Martín Island (Willett, 1913, p. 22, *et al.*); Natividad Island (Lamb, 1927*a*, p. 70); "lower valleys" west of Sierra San Pedro Mártir (Anthony, 1893, p. 235); San José, 2500 feet, latitude 31° (skin in Mus. Vert. Zool. taken May 5, 1925); vicinity of San Fernando (Anthony, 1895*d*, p. 138); Santo Domingo, etc. (Huey, 1926, p. 353); Colorado delta (Rhoads, 1905, p. 689); Colorado delta at a point seven miles east of Cerro Prieto (skin in Mus. Vert. Zool. taken June 6, 1928). The name *Tyto perlata pratincola* has also been used for the Barn Owl in Lower California (Ridgway, 1914, p. 606).

***Asio wilsonianus* (Lesson)**

American Long-eared Owl

Sparse resident in the northwestern coastal portion of the territory north from about latitude 30°. The southernmost known station of occurrence is Rosario, whence a specimen was obtained by W. W. Brown (Thayer and Bangs, 1907*c*, p. 137). The first record was by Bryant (1889*b*, p. 283) citing Belding as having seen the species "occasionally" between Tijuana and the Sierra San Pedro Mártir. Belding himself (1890, p. 47) had reason to consider this owl a "toler-

ably common resident" in the "northern 100 miles of Lower California." Van Rossem (1909, p. 208) reports a vagrant seen April 7 on North Island, of the Los Coronados group. The two skins in the Museum of Vertebrate Zoology were collected by C. C. Lamb, as follows: San José, 2500 feet, latitude 31°, May 5, 1925; Concepción, 6000 feet, on Sierra San Pedro Mártir, November 16, 1925.

***Asio flammeus flammeus* (Pontoppidan)**

Northern Short-eared Owl

Winter visitant south to the southern tip of the peninsula, appearing as a rule on marshlands. Scarce to the southward, but fairly common in the north-western coastal district. Recorded first by Ridgway (*in* Belding, 1883*b*, p. 533, under the name *Asio accipitrinus*) as taken by Xantus at Miraflores, November 25. Other Cape-district stations are: Cape San Lucas, specimen, March 23 (Townsend, 1923, p. 14, under *Asio flammeus*); San José del Cabo, three seen in February (Lamb, 1927*b*, p. 156). Records to the northward are: Coast region north of San Fernando and below 800 feet altitude [according to Anthony] (Bryant, 1889*b*, p. 284); North Island, Los Coronados group, one bird, April 8 (Osburn, 1909, p. 137); lower Colorado River, December 4 (Price, 1899, p. 92); mouth of Hardy River, "a few seen" in February (Rhoads, 1905, p. 689).

***Otus asio quercinus* Grinnell**

Pasadena Screech Owl

Probably a fairly common resident on the Pacific slope of the northwestern section of the territory north of about latitude 30° 30'. Screech Owls were seen or heard by Anthony several times in the coast belt west of the main Sierra San Pedro Mártir, but no specimen was obtained (Bryant, 1889*b*, p. 284, and Anthony, 1893, p. 234, under the name *Megascops asio trichopsis*). At San José, 2500 feet altitude, near latitude 31°, Screech Owls are common (J. Grinnell and C. C. Lamb, MS); a specimen was taken there May 5, 1925 (no. 47239, Mus. Vert. Zool.), and, while best referable, I now think, to the race *quercinus*, it is not typical. On November 27, 1927, Mr. Lamb obtained a similar example in the north end of Nachoguero Valley, 3400 feet altitude, just south of the United States line, and on January 6, 1928, Mr. J. Elton Green captured another in the south end of Valle de las Palmas, 1200 feet altitude, not far to the southwestward. Both these additional specimens are now in the Museum of Vertebrate Zoology.

***Otus asio gilmani* Swarth**

Sahuaro Screech Owl

Doubtless fairly common as a resident in parts of the Colorado delta in the extreme northeastern section of the territory, south to the limit of growth of cottonwoods and willows. Screech Owls were heard along the lower Colorado River in December by Price (1899, p. 92, under the name *Megascops asio trichopsis*), and in the Colorado delta in February by Rhoads (1905, p. 689, under *Megascops asio cineraceus*). A skin (breeding male) in the Museum of Vertebrate Zoology was obtained by C. C. Lamb, ten miles west of Pilot Knob and one mile south of the United States boundary, March 15, 1928. It is probable that this race is covered under the name *Otus asio cineraceus* as used in the third edition of the A. O. U. Check-list (1910, p. 173).

Otus asio cineraceus (Ridgway)

Mexican Screech Owl

Probably a fairly common resident locally on both slopes of the peninsula in a predominantly Lower Sonoran belt from about latitude 29° north to 30° 30' on the Pacific slope and to 31° 30' on the eastern side. Stations whence I have examined specimens referable to *cineraceus* are: Six miles east of El Rosario (8 skins in San Diego Soc. Nat. Hist. taken by L. M. Huey, April 10 and 11, 1923); mouth of El Cajón Cañon, 3200 feet altitude, east base of Sierra San Pedro Mártir (3 skins in Mus. Vert. Zool. taken by C. C. Lamb, May 25 and June 2, 1926). I am unable satisfactorily to distinguish the supposed race *Otus asio cardonensis* of Huey (1926, p. 360) with type taken by himself, April 18, 1923, in Cañón San Juan de Dios, 10 miles east of El Rosario, near latitude 30°. There certainly ought to be characters for distinguishing such a race from the *cineraceus* of Arizona, especially in as much as the race *gilmani* apparently intervenes; but differences, if they exist, are so minutely matters of averages as to be bafflingly difficult of detection and surely not worthy of recognition in present-day nomenclature.

Otus asio xantusi (Brewster)

Xantus Screech Owl

Common resident in the Cape district, whence reported from many localities, all south of La Paz. Apparently occurs from the coastal lowlands (Arid Tropical life-zone) up to the tops of the Victoria Mountains. First recorded by Baird, Brewer and Ridgway (1874, III, p. 52, under the name *Scops asio*, var. *macalli*) as taken by Xantus at Cape San Lucas (see also Ridgway, in Belding, 1883b, p. 533, under *Scops trichopsis*). The subspecies originally named by Brewster (1902, pp. 93-94) as *Megascops xantusi*, with type [now no. 247301 in Mus. Comp. Zool.] taken at Santa Anita, June 3, 1896, by Loye Miller. Bryant (1889b, p. 284, under *Megascops asio trichopsis*) records that he heard Screech Owls far north of the Cape district, at Cardón Grande and El Rancho Viejo [between lats. 27° 30' and 28° 40']; but in want of specimens, the subspecies represented there is uncertain.

Bubo virginianus pacificus Cassin

Pacific Great Horned Owl

Common resident of the northwestern section of the territory, west of the Colorado Desert and north from about latitude 30°. First reported from the Sierra San Pedro Mártir and the coastal region directly to the westward (Bryant, 1889b, p. 284, and Anthony, 1893, p. 235, both under the name *Bubo virginianus subarcticus*). Anthony (1895d, p. 138) further recorded what was probably this race from the vicinity of San Fernando. Thayer and Bangs (1907c, p. 137, under *Bubo magellanicus pacificus*) record from Rosario [near lat. 30°] two specimens taken November 18 as, "without doubt, migrants or winter visitors," since breeding birds from the same place they identify as *elachistus*. I think extremes of individual variation are more likely to have figured here. Huey (1926, p. 354) obtained good *pacificus* at Santo Domingo [lat. 30° 45'], June 1; and specimens are in the Museum of Vertebrate Zoology as follows: Rancho Ojos Negros, latitude 31° 50', November 6, 1926 [darker colored than typical of *pacificus*]; La Grulla at 7500 feet, Sierra San Pedro Mártir, May 27, 1925; San José, 2500 feet, May 6, 1925; San Antonio Ranch, 2100 feet, upper Santo Domingo River, April 27, 1925; Colnett, October 29, 1925 [paler than typical of *pacificus*]; five miles south of Monument 258, January 2, 1928.

Bubo virginianus pallescens Stone

Western Great Horned Owl

Common resident at the extreme northeast, in the Colorado Desert district. First recorded by Price (1899, p. 92, under the name *Bubo virginianus sub-arcticus*) from the lower Colorado River, in December. Oberholser (1904, p. 182, under *Asio magellanicus pallescens*) recorded specimens from Salton River and Gardiners Lagoon, just south of the United States boundary. Stone and Rhoads (1905, p. 681) report this owl as found "everywhere abundant" in February in the Colorado delta, and as nesting at Bruce's ranch on the Hardy River. The Museum of Vertebrate Zoology contains a series of specimens taken on the Alamo River, twenty miles southwest of Pilot Knob.

Bubo virginianus elachistus Brewster

Dwarf Great Horned Owl

Common resident in the Cape district and thence north through the waist of the peninsula as far as latitude 30°. First recorded by Baird (1859, p. 302, under the name *Bubo virginianus*) as taken by Xantus at Cape San Lucas. The subspecies was newly named as above by Brewster (1902, p. 96), with type [now no. 217866 in Mus. Comp. Zool.] from the Sierra de la Laguna, taken by M. A. Frazar, May 31, 1887. Bryant (1889b, p. 284, under *Bubo virginianus sub-arcticus*) records Horned Owls from the mainland opposite Magdalena Island, nesting, and from Comondú, Ubi [= Yubay], and Calmallí—localities well scattered from near latitude 25° to above 29°. Thayer and Bangs (1907c, p. 137, under *Bubo magellanicus elachistus*) record positively this race from Rosario [lat. 30°], and they indicate its occurrence "north at least to San Quintín," though I am inclined to think intergrades well toward *pacificus* are concerned here. Oberholser (1904, p. 184, under *Asio magellanicus elachistus*) records specimens of this form only from various localities in the Cape district north to La Paz. Townsend (1923, p. 14) records specimens from Angel de la Guardia and Espíritu Santo islands, as well as from points in the Cape district. There are too many ascriptions to the latter region to justify enumerating them all here.

Speotyto cunicularia hypugaea (Bonaparte)

Northern Burrowing Owl

Widely resident, both on the mainland at low altitudes, and on most of the islands; common at the north, rather rare in the Cape district. First recorded by Baird, Brewer and Ridgway (1874, III, pp. 91, 92) from Cape San Lucas and San José del Cabo, doubtless as taken there by Xantus; then by Sharpe (1875, pp. 144, 145, under the name *Speotyto cunicularia*) from Magdalena Bay. Reported many times from Guadalupe Island, beginning with Bryant (1887a, p. 284). A supposed new race, *Speotyto cunicularia beeki*, type in Zoological Mus., Tring, taken by R. H. Beck (his no. 33, *vide* Dr. E. Hartert) December 1, 1900, was named from there (Rothschild and Hartert, 1902, p. 405), but not on satisfactory grounds (see Thayer and Bangs, 1908, p. 104, and Allen, 1909, p. 320). Other islands whence reported are: Los Coronados Islands (van Rossem, 1909, p. 208); Todos Santos Islands (Kaeding, 1905, p. 134, and other writers); San Gerónimo Island (Willett, 1913, p. 22); San Benito Islands (McGregor, 1897, p. 42, *et al.*); Cedros Island (Bryant, 1886, p. 63, *et al.*); Natividad Island (Anthony, 1925, p. 296, *et al.*); Magdalena and Santa Margarita islands (Bryant,

1889*b*, p. 285); Ángel de la Guardia Island (Townsend, 1923, p. 15). Some other mainland stations are: Colorado delta region, near Mexicali south to near Black Butte (Murphy, 1917, p. 89, and Bancroft, 1922, p. 98); Carriso Valley, etc., near the U. S. boundary (Anthony, 1893, p. 235); San Quintín Bay (Howell, 1911, p. 152); near San Fernando (Anthony, 1895*d*, p. 138); Rosario and San Jabier (Thayer and Bangs, 1907*c*, p. 137); La Paz, Todos Santos, etc., in the Cape district (Brewster, 1902, p. 97, Thayer, 1909*b*, p. 142, and Lamb, 1927*b*, p. 156). Specimens are in the Museum of Vertebrate Zoology from: Todos Santos Islands, January 12 and 16, 1927; San Ramón, mouth of Santo Domingo River, March 18, 1925; Alamo River, twenty miles southwest of Pilot Knob, January 24, 1928.

***Glaucidium gnoma hoskinsi* Brewster**

Hoskins Pigmy Owl

Fairly common resident, chiefly on the mountains (Upper Sonoran zone), in the Cape district; occurs also north nearly to latitude 27°. First recorded, and the subspecies newly described, by Brewster (1888*b*, p. 136), with type [now no. 214153 in Mus. Comp. Zool.] taken by M. A. Frazar on the Sierra de la Laguna, May 10, 1887. Other Cape-district record-stations are: Miraflores (Thayer, 1909*b*, p. 143, and Townsend, 1923, p. 15, under the binomial *Glaucidium hoskinsi*); Triunfo, etc. (Ridgway, 1914, p. 788). To the northward, recorded from: Comondú, specimen obtained (Bryant, 1889*b*, p. 285); Agua Grande [near lat. 26° 30'], heard (Nelson, 1921, p. 36).

***Micropallas whitneyi sanfordi* Ridgway**

Sanford Elf Owl

Common resident locally in the Cape district, where found both on the plains and in the foothills. Recorded first by Belding (1883*b*, p. 549, under the name *Micrathene whitneyi*) from Miraflores, where four specimens were obtained in April, 1882 (see Bryant, 1889*b*, p. 285, under *Micropallas whitneyi*). Belding (1883*c*, p. 349), the next year, heard what he supposed to be the Elf Owl in various parts of the Victoria Mountains. Thayer (1909*b*, p. 142) records it from Eureka [7 miles south of Buena Vista], as well as from Miraflores. Townsend (1923, p. 15) records specimens from Miraflores and San Bernardo Mountain, and Lamb (1927*b*, p. 157) records specimens from Miraflores and Todos Santos. The subspecies was newly named by Ridgway (1914, p. 809), with type [no 234166 in U. S. Nat. Mus.] from Miraflores, as taken there by W. W. Brown, Jr., June 24, 1912. Rather curiously, there is so far no known occurrence of the Elf Owl in Lower California north of about latitude 23° 40'.

***Crotophaga sulcirostris pallidula* Bangs and Penard**

Lower California Groove-billed Ani

Fairly common locally in the lowlands of the Cape district. Reported first by Belding (1883*b*, p. 546, under the name *Crotophaga sulcirostris*) as found by him nesting in 1882 at San José del Cabo. He also found it to the northward, at Santiago and at San Pedro near Todos Santos [west coast, lat. 23° 24'] (Bryant, 1889*b*, p. 285). Frazar (Brewster, 1902, p. 100) found the species nesting at San José del Cabo in 1887; and Bryant (1891, p. 191) found it at the same place in September, 1890. Ridgway (1916, p. 95) records the species from La Paz, the northernmost station of known occurrence. Nelson (1921, pp. 112,

123) was inclined to the belief that this bird leaves the peninsula for the winter season, going across the Gulf to the Mexican mainland. But the fact, which I have verified, that the Anis of the Cape district are easily distinguishable from any Mexican birds, argues otherwise. The Lower California subspecies was named by Bangs and Penard (1921, p. 365), with type [now no. 217148 in Mus. Comp. Zool.] from San José del Cabo, taken by M. A. Frazar, October 12, 1887. As far as I can find, no collector within the past twenty years has found the Ani in Lower California. Since its haunts were close to human habitations, where its presence could hardly be overlooked, there is a chance that it has become exterminated.

***Geococcyx californianus* (Lesson)**

California Road-runner

More or less common resident at the lower levels on the mainland for the entire length of the territory. There is no known occurrence on any of the islands. First recorded by Botta (1835, p. 123, under the name *Saurothera Californiana*) from "le cap Saint-Lucas"; then by Baird (1859, p. 303) as taken by Xantus at the same place. Some selected ascriptions are as follows: Colorado delta region from Mexicali south nearly to the Gulf (Murphy, 1917, p. 90, Price, 1899, p. 92, and other writers); Todos Santos [= Ensenada] (Bryant, 1886, p. 62); lower valleys west of Sierra San Pedro Mártir (Anthony, 1893, p. 235, *et al.*); San Quintín (Howell, 1911, p. 152, *et al.*); San Fernando (Anthony, 1895*d*, p. 138); Rosario and Santana (Thayer and Bangs, 1907*c*, p. 136); Calmallí and Comondú (Bryant, 1889*b*, p. 285); San José del Cabo (Bryant, 1891, p. 192, *et al.*). Cape district birds have been said to be smaller than more northern ones (Baird, Brewer and Ridgway, 1874, II, p. 473); but after examining an appropriate series [in Brewster coll.] I have failed to get hold of any good character for a possible southern race. Four skins are in the Museum of Vertebrate Zoology, of following data: Esperanza Rancho, twelve miles east of San Ignacio, May 14, 1927; San José, 2500 feet, latitude 31°, November 9, 1925; Valle de las Palmas, January 14, 1928; Colorado River twenty miles south of Pilot Knob, October 12, 1927.

***Coccyzus americanus occidentalis* Ridgway**

California Yellow-billed Cuckoo

Rare and very local summer resident. Recorded definitely from only five places: Ensenada, one "observed" in August by A. W. Anthony (Bryant, 1889*b*, p. 286, and Bendire, 1895, p. 26); El Valle de la Trinidad, one heard and seen June 30, 1927 (Huey, 1928*a*, p. 158); San José del Rancho, in the Cape district, found by Frazar "rather common" after July 5 [in 1887] (Brewster, 1902, p. 101); San José del Cabo, June 29, 1923, and Todos Santos [lat. 23° 27'], September 3, 1924, met with but "once" at each place (Lamb, 1927*b*, p. 157). There is a good series in the Brewster collection, obtained by Frazar, which I have examined and found to show well the characters of *occidentalis*. Rumors of occurrence in the Sierra de la Laguna (Brewster, *loc. cit.*) have not been confirmed, despite the visits of many collectors there since the days of Frazar.

Since the above was written, the Museum of Vertebrate Zoology has received four skins taken by C. C. Lamb in the Colorado delta at a point seven miles east of Cerro Prieto, June 2, 4, 14 and 15, 1928. The species was evidently breeding here, in the willow association. The specimens are in minor respects not typical of *occidentalis*.

Megaceryle alcyon caurina (Grinnell)

Northwestern Belted Kingfisher

Varyingly common as a transient or winter visitant south, mostly coastwise, the whole length of the peninsula. First reported by Belding (1883*b*, p. 543, under the name *Ceryle alcyon*) as "common" in winter in the Cape region. Then Bryant (1889*b*, p. 286) records the species as occurring "in fall and winter" about the bays of Ensenada and San Quintín; also on Santa Margarita Island. Anthony (1893, p. 235) reports one "heard" [in May] at La Grulla, on the Sierra San Pedro Mártir. Other record stations are: Los Coronados Islands, in April (Osburn, 1909, p. 137) and on August 13 (Howell, 1917, p. 60); San Martín, San Gerónimo and Cedros islands, and Santo Tomás anchorage [about lat. 31° 30'], in April (Willett, 1913, p. 22); Natividad Island, in December (Lamb, 1927*a*, p. 70, under *Ceryle alcyon caurina*); San Quintín, in April (Howell, 1911, p. 152); La Paz and San José del Cabo, in autumn [earliest August 25] (Brewster, 1902, p. 102); Magdalena Bay and La Paz, in March (Townsend, 1923, p. 15, under *Megaceryle alcyon*); Pond Lagoon, April 13 to 17 (Huey, 1927*g*, p. 243); lower Colorado River in December, Colorado delta in February, and Volcans Lake, April 25 (Price, 1899, p. 92, Rhoads, 1905, p. 690, and Murphy, 1917, p. 90). Specimens are contained in the Museum of Vertebrate Zoology from: Todos Santos Islands, January 16, 1927; San Felipe, on the Gulf, April 14, 1926. This bird has also been recorded from Lower California under the name combination of *Streptoceryle alcyon caurina* (Ridgway, 1914, p. 420).

Dryobates villosus scrippsae Huey

Lower California Hairy Woodpecker

Common resident in the Sierra Juárez and the Sierra San Pedro Mártir, where closely adherent to the coniferous forests (Transition zone, chiefly). First recorded by Bryant (1889*b*, p. 286, under the name *Dryobates villosus harrisi*) as seen at "Hansen's" [= Laguna Hanson] by Belding, May 14, 1884, and by Anthony on the Sierra San Pedro Mártir. Anthony (1893, p. 236, and 1896*a*, pp. 31, 34, under *Dryobates villosus hyloscopus*) gives further information from the latter district. Oberholser (1911*b*, pp. 611-12) lists with critical comments specimens from Piñón, La Grulla, Hanson Laguna, 60 miles south of Campo [California], and Santa Ulalia [Santa Eulalia, the southernmost station for the species]—all localities within the two mountain masses named above. Huey (1927*c*, p. 9) newly separates the subspecies as above, with type [no. 10847 in coll. San Diego Soc. Nat. Hist.] taken by himself at La Grulla, 7500 feet, September 27, 1926; he records specimens also from La Encantada [near-by], and from El Rayo and Laguna Hanson, in the Sierra Juárez. The extensive series in the Museum of Vertebrate Zoology represents the following localities: Laguna Hanson, 5200 feet; Concepción, 6000 feet; La Grulla, 7200 to 7500 feet; La Encantada, 7400 feet; Vallecitos, 7500 to 8500 feet.

Dryobates scalaris cactophilus Oberholser

Cactus Ladder-backed Woodpecker

Common resident locally in the Colorado desert district. Life-zone, Lower Sonoran. First reported by Price (1899, p. 92, under the name *Dryobates scalaris bairdi*) from the Colorado "river bottom and south as far as the timber extends."

Stone and Rhoads (1905, p. 681) and Murphy (1917, p. 90), both, curiously, under the name *Dryobates scalaris lucasanus*, found this woodpecker along the east base of the Cocopah Mountains. Oberholser (1911a, p. 155) in his "Revision" records specimens from several places in the delta, from Gardners Laguna on Salton River south to the vicinity of Colony [near lat. 32°]. Skins are in the Museum of Vertebrate Zoology with following data: El Major, on the Hardy River, April 24, 1926; Colorado River, twenty miles south of Pilot Knob, October 18 and 24, 1927; Alamo River, twenty miles southwest of Pilot Knob, January 19 to 31, 1928; Colorado River at latitude 32° 15', February 29 and March 3, 1928; seven miles east of Cerro Prieto, February 25, May 27 and June 6, 1928; Las Palmas Cañon, west side Laguna Salada, November 9, 1927; north end Nachoguero Valley, 3400 feet, November 25, 1927. The last designated occurrence is notable in that it is the westernmost, is over the top of the divide from the desert onto the Pacific drainage, and is in a locality in which *D. nuttallii* is the common resident form; it was probably a case of vagrancy.

***Dryobates scalaris eremicus* Oberholser**

San Fernando Ladder-backed Woodpecker

Common resident of the north-central and northwestern portions of the territory, north from about latitude 28° 30' nearly to latitude 32°, locally, on the Pacific slope. It was doubtless this form that was recorded by Bryant (1889b, p. 286, under the name *Dryobates nuttallii*, part) as seen by Anthony among "the caeti of the coast hills" in the northern section of the territory; for Anthony himself (1893, p. 236, under *Dryobates scalaris lucasanus*) so indicates, and he records a specimen taken at San Telmo. This subspecies is now known to be widely present in the cactus association from the vicinity of San Fernando north on the Pacific slope to as far, sparingly, as the vicinity of Ensenada [though not to "Nachoguero Valley"] (see Oberholser, 1911a, p. 152). Some other recorded stations are: Colnett, San José, El Valle de la Trinidad, San Quintín, San Simón River. The race *eremicus* was newly named by Oberholser (1911a, p. 151), with type [no. 196255 in U. S. Nat. Mus.] from San Fernando, taken by E. W. Nelson and E. A. Goldman, September 4, 1905. The same author applies this name to specimens from as far south as Ubai and Playa María Bay [near lat. 29°]; and it is this race also that extends north along the eastern slope of the peninsula at least to latitude 31°. The series of specimens in the Museum of Vertebrate Zoology represents the following localities: San Ramón, mouth of Santo Domingo River; Santo Domingo; Arroyo Nuevo York, 15 miles south of Santo Domingo; Colnett; San Telmo; San José, 2500 feet; Concepción, 6000 feet; El Valle de la Trinidad, 2500 feet; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir; San Felipe, on the Gulf. I have examined the type [no. 10448, coll. San Diego Soc. Nat. Hist.] and one other specimen, both taken near San Felipe April 13, 1926, upon which the new name *Dryobates nuttallii longirostrata* [sic] was based (Huey, 1927d, p. 27) and find them unquestionably referable to *eremicus*. The record (Oberholser, *loc. cit.*, and Ridgway, 1914, p. 253) of "*eremicus*" from Nachoguero Valley, close to the United States boundary, was based on a specimen (now no. 61050, Am. Mus. Nat. Hist., taken by F. X. Holzner, June 2, 1894) which I have examined and found to be *D. nuttallii*, typical for worn post-breeding condition.

Dryobates scalaris lucasanus (Xantus)

San Lucas Ladder-backed Woodpecker

Common resident of the plains and foothills in the Cape district and thence north through the waist of the peninsula to about latitude $28^{\circ} 30'$. First recorded, and the form newly described, by Xantus (1859, p. 298, under the name

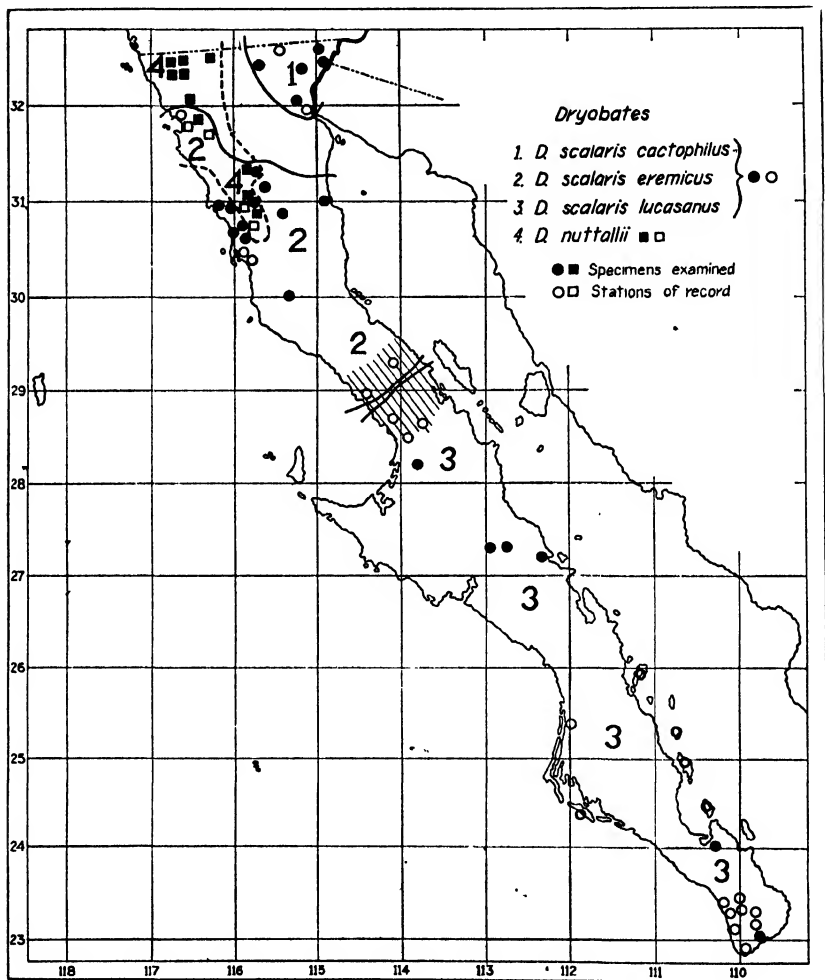


Fig. 5. Distribution of Ladder-backed Woodpeckers, part of genus *Dryobates*, in Lower California. Intergradation between races shown by shading.

Picus lucasanus) from Cape San Lucas; type in U. S. Nat. Mus. (no. 12938, taken in May, 1859). The many subsequent records appear under a variety of name-combinations: *Picus scalaris* (Coues, 1872, p. 193); *Picus scalaris lucasanus* (Belding, 1883b, p. 543, and others); *Dryobates lucasanus* (Brewster, 1902, p. 102); *Dendrocopos lucasanus* (Hargitt, 1890, p. 250, et al.); *Dendrocopos scalaris lucasanus* (Thayer and Bangs, 1907c, p. 136, et al.). This woodpecker has been

reported from several islands, as follows: Carmen, San Josef, and Santa Cruz islands (Townsend, 1923, p. 15); Espiritu Santo Island (Nelson, 1921, p. 92); Santa Margarita Island (Bryant, 1889*b*, p. 286, *et al.*). Some mainland stations of record north of the Cape district are: San Ignacio, Santo Domingo [lat. 28° 15'], and Rosarito [28° 35'] (Oberholser, 1911*a*, p. 151); San Andrés and Santana (Thayer and Bangs, *loc. cit.*). The Museum of Vertebrate Zoology contains specimens of this race from the following localities: Rancho Mesquital, 33 miles west of Calmallí; San Ignacio; La Esperanza Rancho, 12 miles east of San Ignacio; San Lucas, latitude 27° 14', on the Gulf; La Paz; San José del Cabo.

***Dryobates nuttalli* (Gambel)**

Nuttall Ladder-backed Woodpecker

Common resident of the willow-cottonwood and live-oak associations in the Upper Sonoran life-zone almost wherever such occur in the northwestern section of the territory. First recorded by Bryant (1889*b*, p. 286) as found by Anthony at the west base of the Sierra San Pedro Mártir and by Belding at Ensenada and San Rafael [25 miles east of Ensenada]. Stations of known occurrence are now many; all are on the Pacific drainage and they extend south from the United States boundary to about latitude 30° 45' on the western flank of the Sierra San Pedro Mártir. The southernmost station is Santo Domingo, north of San Quintín (Huey, 1926, p. 354). Localities represented by specimens in the Museum of Vertebrate Zoology are as follows: Nachoguero Valley, 3400 feet; south end of Valle de las Palmas, 1200 feet; Tecate; Las Cruces, east of Ensenada; El Valle de la Trinidad, 2500 feet; San José, 2500 feet; Valladares, 2700 feet. This species has been recorded from Nachoguero Valley under the name *Dryobates scalaris eremicus* (by Oberholser, 1911*a*, p. 152, and by later authors in consequence).

***Sphyrapicus varius nuchalis* Baird**

Red-naped Yellow-bellied Sapsucker

Sparingly winter visitant south clear to the Cape district. First recorded by Belding (1883*c*, p. 349) from La Laguna [lat. 23° 35'] where a specimen was taken February 1, 1883, and individuals "probably" seen on two other occasions; the specimen taken is no. 89820 in the U. S. National Museum (*fide* C. W. Richmond). Ridgway (1914, p. 280) records this sapsucker from Santa Rosarita [= Rosarito, lat. 28° 35'] and Río San Pedro [south of La Paz]. Five specimens with the following data are in the Museum of Vertebrate Zoology: San José, 2500 feet altitude, latitude 31°, four, October 20, 23, and 26, 1925, all shot from large willows; Álamo River, twenty miles southwest of Pilot Knob, January 24, 1928, one, shot from cottonwood.

***Sphyrapicus varius daggetti* Grinnell**

Sierra Nevada Red-breasted Sapsucker

Sparingly winter visitant south into the northwestern section of the territory to about latitude 30°. First recorded by Bryant (1889*b*, p. 286, under the name *Sphyrapicus ruber*) as seen by A. W. Anthony in March near Ensenada. Thayer and Bangs (1907*c*, p. 136) report a bird taken at Rosario, November 2, which provides the southernmost known occurrence to date. Huey (1926, p. 354, and 1927*a*, p. 153) reports a bird seen at Santo Domingo, March 1, and specimens taken at Laguna Hanson, October 14, and at Rancho San Pablo, December 1 and 5. The Museum of Vertebrate Zoology contains specimens with the following data: San José, latitude 31°, October 18, 1925; Santo Domingo, December 4, 1925; El Valle de la Trinidad, November 22, 1926.

***Sphyrapicus thyroideus thyroideus* (Cassin)**

Pacific Williamson Sapsucker

Winter visitant sparingly south over the Sierra Juárez and Sierra San Pedro Mártir, with occurrences as follows: Laguna Hanson, 5200 feet altitude, October 25, 1926; El Valle de la Trinidad, 2500 feet, November 18, 1926; and La Grulla, 7200 feet, October 2 and 13, 1925 (Grinnell and Lamb, 1927, p. 124); Laguna Hanson, October 11, 14, and 30, and November 3, 1926 (Huey, 1927a, p. 153).

***Balanosphyra formicivora martirensis* Grinnell and Swarth**

San Pedro Mártir Acorn-storing Woodpecker

Common resident, locally, on the western flanks of the Sierra San Pedro Mártir, and thence north, west of the crest of the Sierra Juárez, nearly or quite to the United States boundary. Life-zone, chiefly Upper Sonoran; live-oak association. First recorded by Bryant (1889b, p. 287, under the name *Melanerpes formicivorus bairdi*) as observed by Belding, in May, 1884, at Hansen's [Hanson Laguna], and by Anthony "a few miles east of Ensenada." Belding (1890, p. 69) indicates that he saw the species most of the way along his route from Campo [Upper California] to "Hansens." Anthony (1893, p. 236) definitely records it from the Sierra San Pedro Mártir. The subspecies was newly named, as above, by Grinnell and Swarth (1926c, p. 176) from those mountains, with type [no. 46252 in Mus. Vert. Zool.] from La Jolla, 6200 feet altitude, taken by C. C. Lamb, October 16, 1925. Apparently the southernmost station is Valladares Creek, a few miles still farther south (Huey, 1926, p. 354). Specimens are now at hand (in Mus. Vert. Zool.) from certain additional localities thence northward; namely, Concepción, 6000 feet, Las Cruces, 2600 feet (east of Ensenada), Hanson Laguna, 5200 feet, and Nachoguero Valley, 3400 feet. Ridgway (1914, p. 107, under the name *Balanosphyra formicivora bairdi*) records the species from very close to the United States boundary—Tecate Valley as well as Nachoguero Valley; specimens from those and other northern places are somewhat intergradient between typical *martirensis* and the race *bairdi* of Upper California.

***Balanosphyra formicivora angustifrons* (Baird)**

Narrow-fronted Acorn-storing Woodpecker

Common resident in the oak belt on the mountains of the Cape district. There are many records from the Victoria Mountains and the included Sierra de la Laguna or their immediate vicinity (Upper Sonoran Zone chiefly), from Triunfo south to "road between San José del Cabo and Miraflores" (Brewster, 1902, p. 105, under the name *Melanerpes angustifrons*). The first record is apparently that of Cassin (1863, p. 328, under *Melanerpes formicivorus*), of specimens taken by Xantus. The subspecies was newly described, from "Cape St. Lucas," by Baird (in Cooper, 1870, p. 405, under the name *Melanerpes formicivorus*, var. *angustifrons*); type, taken by John Xantus in October, 1859, now no. 25947 [fide C. W. Richmond, MS] in U. S. Nat. Mus.; type locality more exactly, San Nicolás, rancho north of Cape San Lucas. Some additional references of importance are: Belding, 1883b, p. 549, and 1883c, p. 349; Bryant, 1891, pp. 196, 198.

***Asyndesmus lewisi* Riley**

Lewis Woodpecker

Winter visitant, sporadically, south over the northwestern section of the territory as far as about latitude 31°. Fairly common in the autumn of 1925

around San José, 2500 feet altitude, and specimens (in Mus. Vert. Zool.) taken there September 29 to November 10; also seen, January 20, 1927, in the vicinity of Guadalupe Valley, latitude 32° (Grinnell and Lamb, 1927, p. 124).

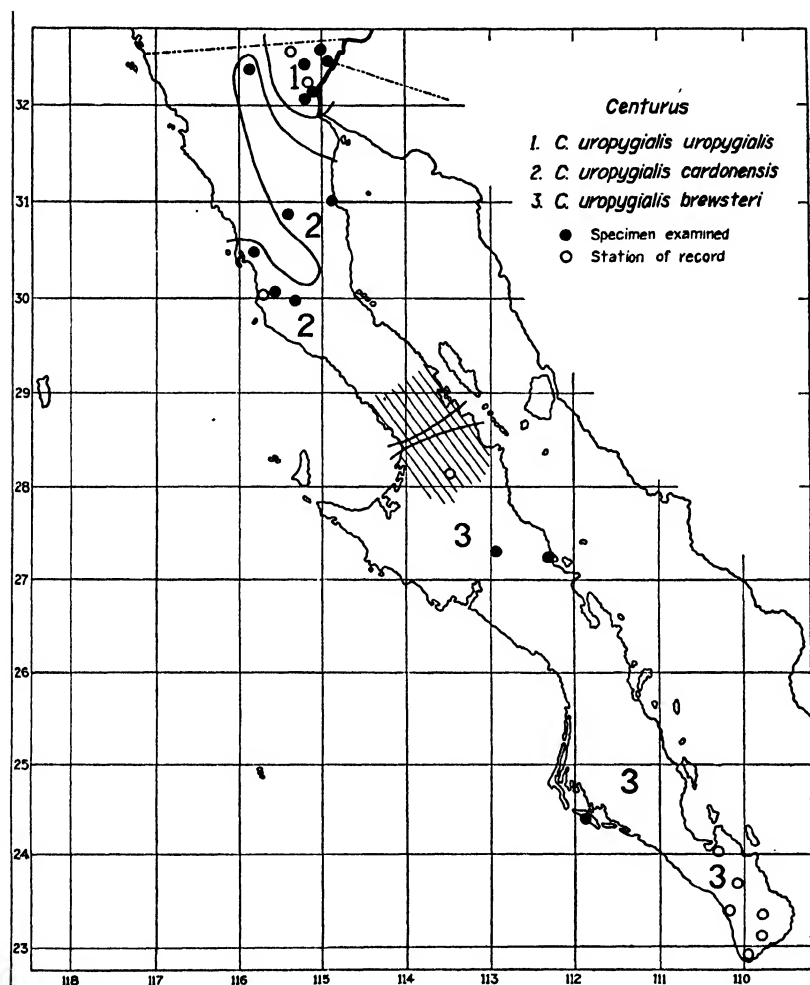


Fig. 6. Distribution of Gila Woodpeckers, genus *Centurus*, in Lower California. Intergradation between races shown by shading.

Centurus uropygialis uropygialis Baird

Arizona Gila Woodpecker

Common resident locally in the Colorado Desert district. Life-zone, Lower Sonoran. First reported (this subspecies) by Price (1899, p. 92, under the name *Melanerpes uropygialis*) as found by him along the lower Colorado River "wherever there was timber." Stone and Rhoads (1905, p. 681) record specimens from the Hardy River and [east base of] "Cocopah Major Mountains," as well as from the Colorado River. Murphy (1917, p. 90) records seeing the species "between

the Hardy and the Cocopahs." Ridgway (1914, p. 95) adds the locality "Gardeners Lagoon." And Grinnell (1927*e*, p. 168) comments critically upon specimens from El Major, latitude 32° 10'. Specimens are now contained in the Museum of Vertebrate Zoology from the latter locality, also from the Colorado River, twenty miles south of Pilot Knob, from the Colorado River at latitude 32° 15', from the Alamo River, twenty miles southwest of Pilot Knob, and from seven miles east of Cerro Prieto.

***Centurus uropygialis cardonensis* Grinnell**

San Fernando Gila Woodpecker

Common resident locally across the upper waist of the peninsula—between about latitudes 28° and 30°, and thence along the western rim of the Colorado Desert north to past 32°. Life-zone, Lower Sonoran. Associated closely with the giant cactus. Definitely recorded from San Fernando and vicinity of El Rosario (Anthony, 1895*d*, p. 138, under the name *Melanerpes uropygialis*), and from San Felipe [on the Gulf], from mouth of El Cajón Cañon, east base of Sierra San Pedro Mártir (skins in Mus. Vert. Zool.), and from three miles east of San Quintín (Grinnell, 1927*e*, p. 168). Additional examples recently acquired by the Museum of Vertebrate Zoology come from the extreme northern station, Las Palmas Cañon, west side of Laguna Salada. The subspecies was newly described by Grinnell (*loc. cit.*) with type [no. 50529 in Mus. Vert. Zool.] from mouth of Cañón San Juan de Dios, within ten miles east of El Rosario, where taken by Mrs. May Canfield, May 2, 1925.

***Centurus uropygialis brewsteri* Ridgway**

San Lucas Gila Woodpecker

Common resident at the lower levels in the Cape district and thence northward to about 28° latitude. Life-zones, Lower Sonoran and Arid Tropical. First recorded by Baird (1859, p. 302, under the name *Centurus uropygialis*) from specimens procured by Xantus at Cape San Lucas. The subspecies *brewsteri* was named by Ridgway (1911*b*, p. 32), with type [no. 151827 in U. S. Nat. Mus.] taken at Santiago by M. A. Frazar, November 25 [not "22"], 1887 (*ſide* C. W. Richmond). Some record stations from north of the Cape district (where widely known) are: Santa Margarita Island (Bryant, 1889*b*, p. 287, under *Melanerpes uropygialis*, and Grinnell, 1927*e*, p. 168); San Ignacio (Nelson, 1921, p. 33); Mulegé (Townsend, 1923, p. 15); Calmallí [near lat. 28°] (Ridgway, 1914, p. 96). A series of skins in the Museum of Vertebrate Zoology from San Ignacio and San Lucas [lat. 27° 14' on the Gulf] are intermediate toward *cardonensis*, but still nearest *brewsteri*.

***Colaptes cafer collaris* Vigors**

Monterey Red-shafted Flicker

Fairly common winter visitant at the north, particularly in the Colorado delta; possibly resident at the extreme northwest. Record stations believed, or definitely known, to pertain to the present race are: Lower Colorado River, in December (Price, 1899, p. 92, under the name *Colaptes cafer*); Nachoguero Valley (Ridgway, 1914, p. 34, part). The Museum of Vertebrate Zoology contains specimens with following data: Tecate, 1600 feet, January 21 and 22, 1927; south end of Valle de las Palmas, January 11, 1928; north end of Nachoguero Valley, November 18, 1927; five and seven miles east of Cerro Prieto, February 7 and 18, 1928; Alamo River, twenty miles southwest of Pilot Knob, January 24 and 25, 1928; Colorado River at latitude 32° 15', March 2 and 6, 1928.

Colaptes cafer martirensis* Grinnell*San Pedro Mártir Red-shafted Flicker**

Common resident on the western slopes of the Sierra Juárez and Sierra San Pedro Mártir; in winter invading westwardly to the seacoast. Breeds in Upper Sonoran and Transition zones. First recorded (undoubtedly this subspecies, at least in part) by Bryant (1889*b*, p. 287, under the name *Colaptes cafer*) as reported by Belding from San Rafael (east of Ensenada) and by Anthony from the Sierra San Pedro Mártir in summer and "coastwise" in winter. The latter facts were subsequently re-affirmed by Anthony (1893, p. 236). The southernmost station is Santa Eulalia [in the southern end of the San Pedro Mártirs] (Ridgway, 1914, p. 34, under *Colaptes cafer collaris*). The subspecies *martirensis* was described by Grinnell (1927*a*, p. 67) with type [no. 46253 in Mus. Vert. Zool.] from La Grulla, 7200 feet altitude, taken by C. C. Lamb, October 8, 1925. Red-shafted Flickers have been seen in March and April on Todos Santos Islands (Kaeding, 1905, p. 134, and Howell, 1912, p. 190), but the subspecies represented is problematic. Specimens of *martirensis* are contained in the Museum of Vertebrate Zoology representative of the following localities: Nachoguero Valley, 3400 feet, near United States boundary (November 18 to 29, 1927); south end of Valle de las Palmas, 1200 feet (January 5, 1928); Laguna Hanson, 5200 feet, Sierra Juárez (October); El Valle de la Trinidad, 2500 feet (November and December); Vallecito at 7500 feet (June), and La Grulla, 7200 feet (October), Sierra San Pedro Mártir; San José, 2500 feet (May and October). It is possible that the occurrences here noted from Nachoguero Valley and Valle de las Palmas pertain to vagrants from the south, or to extreme variants of the resident population which is more or less intermediate toward *collaris*.

Colaptes cafer rufipileus* Ridgway*Guadalupe Red-shafted Flicker**

Restricted to Guadalupe Island, where formerly fairly common, chiefly among the cypresses at the higher elevations (Transition life-zone). Now apparently extinct. First recorded, and newly described, by Ridgway (1876*b*, p. 191, under the name *Colaptes mexicanus rufipileus*) from three specimens taken by Edward Palmer; the type was taken February 20, 1875, and is no. 70000 in U. S. Nat. Mus. (*file* C. W. Richmond). The best general account is that by Bryant (1887*a*, p. 285, under *Colaptes rufipileus*). Other important references are: Ridgway, 1877, pp. 60-66 (phylogeny); Thoburn, 1899, p. 278 ("among the pines" in June, 1897); Kaeding, 1905, p. 134 ("rarely seen" in spring of 1897); Thayer and Bangs, 1908, p. 104 ("not more than forty individuals" all told, in spring of 1906); Anthony, 1925, p. 279 ("no doubt totally extinct" in 1922). The Museum of Vertebrate Zoology contains, by gift from John E. Thayer, a pair of specimens collected by W. W. Brown, Jr., and H. W. Marsden, June 16 and 18, 1906.

Colaptes chrysoides mearnsi* Ridgway*Mearns Gilded Flicker**

Sparing resident locally of the Colorado Desert district. Apparently restricted to the riparian timber along the Colorado River and its distributaries. Life-zone, Lower Sonoran. First ascribed to that territory by Ridgway (1911*b*, p. 32), but without detailed data; see also Nelson (1921, p. 126). The Museum of Vertebrate Zoology contains three specimens taken by C. C. Lamb on the Álamo River, twenty miles southwest of Pilot Knob, January 23, 24 and 27, 1928; all shot from cottonwoods.

Colaptes chrysoides brunescens* Anthony*San Fernando Gilded Flicker**

Common resident locally in the upper waist of the peninsula, about from 28° to 30° latitude, where closely associated with the cirio and cardon. Life-zone, Lower Sonoran. First recorded by Anthony (1895d, p. 139, under the name

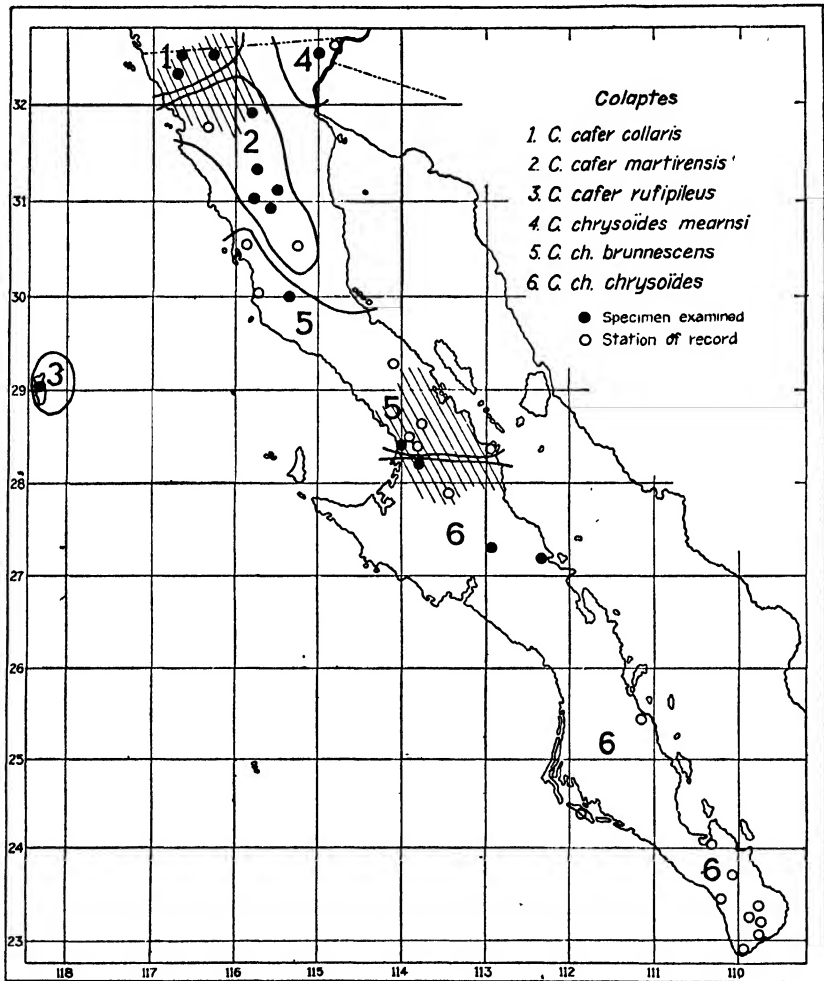


Fig. 7. Breeding ranges of Flickers, genus *Colaptes*, in Lower California. Intergradation between races shown by shading.

Colaptes chrysoides) from San Fernando, and shortly thereafter the subspecies newly named from there by him (1895g, p. 347), with type [now no. 20328, Carnegie Mus.] taken by him May 27, 1894. Other stations of known occurrence are: Rosario, Santana, Rosarito, and San Jabier (Thayer and Bangs, 1907c, p. 136); San Francisquito Bay, on the Gulf side (van Rossem, MS); six miles northeast of San Quintín [northwesternmost station] (Huey, 1926, p. 354).

Colaptes chrysoides chrysoides (Malherbe)

San Lucas Gilded Flicker

Common resident at the lower levels in the Cape district; also resident locally northward to about latitude 28°, somewhere near which intergradation with the race *brunneescens* takes place. Life-zones, Arid Tropical and Lower Sonoran; association, the giant cactus chiefly. The species was described by Malherbe [1852, p. 553, under the name *Geopicus* (*Colaptes*, Sw.) *chrysoides*] from simply "America." Later, the same author (Malherbe, 1862, pp. 261-62, pl. CIX, using the name *Geopicus chrysoides*) indicates that his original bird, a female, in the collection of the Paris Museum, was obtained in "la Californie" by one "M. Jaurès"; and he describes a second specimen, a male, received through P. L. Selater in 1860, doubtless Xantus-taken, from Cape San Lucas, thus definitely "fixing" this place as the type locality of the species. It therefore seems unnecessary, as done by Ridgway (1914, p. 27), to cite Anthony (1895*d*, p. 139, or 1895*g*, p. 347) as having "fixed" said type locality. Baird (1859, p. 302) was, however, the first definitely to record the species from Cape San Lucas, on the basis of Xantus-taken specimens; and reports from the Cape district since then are numerous. Important ones from there and to the northward are: Cape San Lucas, nesting (Baird, Brewer and Ridgway, 1874, II, pp. 583, 584); Cape region generally (Belding, 1883*b*, pp. 543, 549, and Brewster, 1902, p. 108); Santiago (Cory, 1919, p. 412); Santa Margarita Island (Bryant, 1889*b*, p. 287); Agua Verde Bay and Miraflores (Townsend, 1923, p. 16); La Paz, Triunfo, etc. (Hargitt, 1890, p. 17); San Ignacio, near Calmallí, etc. (Ridgway, 1914, p. 27). The series of specimens in the Museum of Vertebrate Zoology was obtained at the following places: San Lucas, latitude 27° 14', on the Gulf; San Ignacio; Rancho Mesquital, 33 miles west of Calmallí; shore of Santa Rosalía Bay (intermediate, possibly nearer *brunneescens*).

Phalaenoptilus nuttallii californicus Ridgway

Dusky Poor-will

Common in the northwestern section of the territory; in summer in the Transition and Upper Sonoran zones, through the winter at low levels coastwise. Occurs in summer on the Sierra San Pedro Mártir at least up to 7200 feet altitude. First recorded by Bryant (1889*b*, p. 287) as noted by Belding "at several places between Tia Juana and San Pedro Mártir." Anthony (1893, p. 236, and 1895*d*, p. 139, in the latter place under the name *Phalaenoptilus nuttallii*) reports the species from the San Pedro Mártirs up to "8500 feet" in May, and from Burro Cañon, north of Ensenada. A bird was seen on one of the Todos Santos Islands in April (Howell, 1912, p. 190). Huey (1926, p. 354) reports the species as breeding at La Joya [6000 feet], and as found at Santo Domingo in February and June. Specimens in Mus. Vert. Zool. are from: San Telmo, April 6 and 7; Aguaje del Sauce, 2600 feet, May 1; Valladares, 2700 feet, April 20; and La Grulla, 7200 feet, May 25, 27 and 28—localities on, or to the westward of, the San Pedro Mártirs. Heard at Colnett the last of October (Grinnell, MS).

Phalaenoptilus nuttallii hueyi Dickey

Colorado Desert Poor-will

Presumably fairly common resident in the Colorado delta. Price (1899, p. 92, under the name *Phalaenoptilus nuttallii nitidus*) records seeing one on the lower Colorado River in December; and Murphy (1917, p. 90, under *Phalaenoptilus*

nuttalli) records seeing two somewhere else in the delta, below Mexicali, the last of March. In the Museum of Vertebrate Zoology is a specimen, typical of *hueyi*, taken by C. C. Lamb on the west side of the Colorado River, 20 miles below Pilot Knob, October 17, 1927.

***Phalaenoptilus nuttallii dickeyi* Grinnell**

San Ignacio Poor-will

Fairly common resident in the Cape district, on the Sierra de la Laguna in summer, at low levels in winter, thence north through the waist of the peninsula to about latitude 30°. Pertains to the Lower and Upper Sonoran life-zones. Poor-wills of undoubtedly the present subspecies were recorded first by Bryant (1889*b*, p. 288, under the name *Phalaenoptilus nuttalli californicus*) from Comondú and Pozo Grande. Brewster (1902, p. 109, under *Phalaenoptilus nuttallii nitidus*) records it from the Sierra de la Laguna in June, from Pierce's Ranch and Triunfo in July, and from San José del Cabo in September. Townsend (1923, p. 16) reports a bird from Miraflores in May. Thayer and Bangs (1907*c*, p. 137) record specimens from Rosario [lat. 30°] in November; and Anthony (1895*d*, p. 139, under *Phalaenoptilus nuttalli*) reports skins from San Fernando, where present at all seasons. I have examined two of Anthony's specimens [May 4 and 8, 1894] from San Fernando [now in Carnegie Mus.] and found them *dickeyi*; he recognized them as different from *californicus*, calling them *nitidus*. I have also examined a skin in the Dickey collection taken at El Sauz, in the Sierra de la Laguna, June 18. Four skins in the Museum of Vertebrate Zoology identifiable as *dickeyi* bear data as follows: San Fernando Mission, June 3, 1927; Rancho Mesquital, 33 miles west of Calmallí, May 28, 1927; San Ignacio, May 5 and 17, 1927. The race *dickeyi* was newly named by Grinnell (1928*b*, p. 153), with type [no. 50820 in Mus. Vert. Zool.] taken by C. C. Lamb at San Ignacio, latitude 27°, May 17, 1927.

***Chordeiles acutipennis texensis* Lawrence**

Texas Sharp-winged Nighthawk

Common in spring and summer at the lower levels in the northern one-fourth of the territory. Specimens in the Museum of Vertebrate Zoology best referred to the subspecies *texensis* come from localities on the east side south to El Major, on the Hardy River; on the Pacific slope south to Santo Tomás, 6000 feet, on the west slope of the Sierra San Pedro Mártir [latitude about 30° 45']. Definitely this race was first recorded from Lower California by Belding (1890, p. 78, under the name *Chordeiles texensis*) as "tolerably common the entire route" from San Diego [California] to the San Pedro Mártir Mountains in May, 1885. Anthony (1893, p. 236, and 1895*a*, p. 139) recorded the species from the "lower valleys" west of the Sierra San Pedro Mártir, casually to as high as La Grulla [7200 feet], and from San Fernando [subspecies there, however, in doubt]. Oberholser (1914, pp. 103-109) records specimens definitely of the present subspecies from Carrizo Valley, on the west slope, and from localities in the Colorado delta. Murphy (1917, p. 90) records the species from the delta proper, as also from Pattie Basin. The skins in the Museum of Vertebrate Zoology represent the following localities: Colorado River, twenty miles south of Pilot Knob, October 12 to 22; ten miles west of Pilot Knob and one mile south of United States boundary, March 15; El Major and 13 miles north of El Major, in the Colorado delta, April 25 and 29; Santo Tomás, 6000 feet, southern part of Sierra San Pedro Mártir, June 4; Aguaje del Sauce, 2600 feet, May 1.

Chordeiles acutipennis inferior Oberholser

San Lucas Sharp-winged Nighthawk

Common resident of the lowlands and foothills in the Cape district (Arid Tropical and Lower Sonoran life-zones); occurs thence northward, less commonly, at least during spring and summer, through the peninsula to about latitude 30° which marks about the mid-line of intergradation between this race and *texensis*. Oberholser (1914, p. 109), it is true, records *inferior* from "north to Santa Cruz, La Grulla, and Valladares in the San Pedro Mártir region"; but specimens from that region, even though varying intergradient, average, I judge, nearest *texensis*. Nighthawks were first recorded from Lower California by Baird (1859, p. 303, under the name *Chordeiles texensis*) from Cape San Lucas, as taken by Xantus. The subspecies *inferior* was newly described by Oberholser (*loc. cit.*), with type [no. 113100 in U. S. Nat. Mus.] taken at Triunfo by M. A. Frazar, June 14, 1887. Other important ascriptions to the Cape district are: Belding (1883*b*, p. 543, under the name *Chordeiles acutipennis texensis*) to La Paz and San José del Cabo; Brewster (1902, p. 111) to Santiago, Pierce's Ranch, Sierra de la Laguna ["one or two" observed], etc.; and Townsend (1923, p. 16) to Miraflores. Records from north of the Cape district are: San Juan and San Jorge [around lat. 26°] (Bryant, 1889*b*, p. 288); Magdalena Bay and Santa Margarita Island (Anthony, 1925, p. 296); San Ignacio (skin in Mus. Vert. Zool. taken May 21, 1927).

Nephoecetes niger borealis (Kennerly)

Northern Black Swift

Rare transient in spring in the northwestern section of the territory. All known records are as follows: "Small flocks migrating northward were seen by Mr. Anthony, during May [1887], at San Quintín, and at San Carlos Landing (sixty miles farther south)" (Bryant, 1889*b*, p. 288, and Anthony, 1895*d*, p. 139, under the name *Cypseloides niger*); San Telmo, April 30, 1893, a pair seen and one shot (Anthony, 1893, p. 236); San Pedro Mártir Mountains (Ridgway, 1911*a*, p. 708).

Chaetura vauxii (J. K. Townsend)

Vaux Swift

Fairly common spring migrant through the northern fourth of the territory; all the records are for April and May, as follows: "A single bird" seen by Belding, May 16, 1885, "between San Rafael and San Pedro Martir," "125 miles southeast of San Diego" (Bryant, 1889*b*, p. 288, and Belding, 1890, p. 80); Tia Juana April 16, Colnett, San Telmo April 30, and La Grulla [Sierra San Pedro Mártir] May 18 (Anthony, 1893, p. 236); El Rosario, May 12 and 14 (Huey, 1926, p. 354); Salton River, Colorado delta (Ridgway, 1911*a*, p. 723). There is also a doubtful record of occurrence in the Cape district: San José del Cabo, "a single bird" supposedly seen on two dates in autumn by Frazar (Brewster, 1902, p. 11). The suggestion of Bendire (1895, p. 183) that this swift may breed in "northern Lower California" has never received support of fact.

Aëronautes melanoleucus (Baird)

White-throated Swift

Varyingly common throughout the entire length of the territory, and reaching some of the islands; present throughout the year locally, at the lower levels. First recorded by Belding (1883*b*, p. 547, under the name *Cypselus saxatilis*)

from San José del Cabo. Some other stations of known occurrence, from south to north, are: Sierra de la Laguna (Brewster, 1902, p. 112); San Borgia [lat. 28° 45'] (Bryant, 1889*b*, p. 289, under the name *Micropus melanoleucus*); Guadalupe Island, nesting (Bryant, 1887*a*, p. 291, Thoburn, 1899, p. 278, Kaeding, 1905, p. 134, and Anthony, 1925, p. 296); San Fernando, resident (Anthony, 1895*d*, p. 139); El Rosario and Socorro (Huey, 1926, p. 354); San Ysidro, nesting, and tops of Sierra San Pedro Mártir (Anthony, 1893, p. 237); Todos Santos Islands (Howell, 1912, p. 190, and all other visitors to those islands); Los Coronados Islands, nesting (Anthony, 1893, p. 237, and other authors). Specimens in the Museum of Vertebrate Zoology bear the following data: Eastern rim of Sierra San Pedro Mártir, four miles southeast of Vallecitos, May 28, 1925 (collected by W. D. Strong); El Cajón Cañon, 2300 to 3200 feet, east base Sierra San Pedro Mártir, May 16 and 20, June 1 and 3, 1926 (collected by C. C. Lamb).

***Archilochus alexandri* (Bourcier and Mulsant)**

Black-chinned Hummingbird

Rare transient or summer resident in the extreme northern end of the territory. Known occurrences are as follows: "Has been occasionally seen along the north-western coast by Mr. Anthony" (Bryant, 1889*b*, p. 289, under the name *Trochilus alexandri*); Hardy River [in Colorado delta], and Rancho San Antonio [west flank of Sierra San Pedro Mártir] (Ridgway, 1911*a*, p. 634); San Telmo, specimen April 6, 1925 (in Mus. Vert. Zool., collected by C. C. Lamb); Colorado delta at a point seven miles east of Cerro Prieto, specimen June 2, 1928 (in Mus. Vert. Zool., taken by C. C. Lamb). I know of no basis for Bendire's (1895, p. 198) ascription to Lower California "in winter."

***Calypte costae* (Bourcier)**

Costa Hummingbird

Abundant summer resident at the lower levels almost throughout the peninsula. Life-zone, chiefly Lower Sonoran; but individuals occur high on the mountains in summer, even to 8500 feet altitude on the Sierra San Pedro Mártir. At the south, especially in the Cape district, also remains in considerable numbers throughout the winter. The species was first described (Bourcier, 1839, p. 294, under the name *Ornismya Costae*) from simply "la Californie." Baird (1858, p. 138, in synonymy under *Atthis costae*) indicates that the type came from "Lower" California; and T. S. Palmer (1918, p. 115) has shown conclusively that the type was obtained by Dr. Neboux, of the ship *Venus*, at Magdalena Bay in December, 1837. The type or types are now probably in the Paris Museum (see Fleming, 1919, p. 39). This hummingbird is so generally recorded from the territory, that I will select only a few of the more important from the many published references: Found by Xantus "extremely abundant" at Cape San Lucas (Baird, in Cooper, 1870, p. 360); Cedros Island, nesting, La Paz, nesting, San José del Cabo, Miraflores, and San Quintín Bay (Belding, 1883*a*, pp. 528, 531, and 1883*b*, p. 542); Cedros Island in January (Bryant, 1886, p. 64, under *Trochilus costae*); Cape region generally (Brewster, 1902, p. 112); La Paz, nest (Ridgway, 1892, pp. 334, 337, 339, pl. XXXIX); Santa Margarita Island, nesting, and Tia Juana to San Pedro Mártir (Bryant, 1889*b*, p. 289); Sierra San Pedro Mártir, nesting (Anthony, 1893, p. 237); San Benito Islands (McGregor, 1897, p. 42); Todos Santos Islands, nesting (Van Denburgh, 1924, p. 70); Los Coronados Islands, nesting (Howell, 1917, p. 104); Agua Verde Bay and San Josef Island

[in the Gulf] (Townsend, 1923, p. 16); San Felipe (Huey, 1927*d*, p. 28); Cocopah Major and Tres Pozos [in the Colorado desert] (Stone and Rhoads, 1905, p. 682, and Murphy, 1917, p. 91). There is a persistent theory (for example, see Bendire, 1895, p. 204) that in the San Pedro Mártir section this hummingbird [same individuals!] nests early at low levels and then nests again the same season at the higher altitudes. Specimens of *costae* in the Museum of Vertebrate Zoology bear the following data: San Felipe, on the Gulf, April 3; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir, May 15; Vallecitos, 7500 to 8500 feet, June 6, 16 and 23; La Grulla, at 7500 feet, May 28.

***Calypte anna* (Lesson)**

Anna Hummingbird

Common resident in the northwestern section of the territory, altogether on the Pacific slope and chiefly within the Upper Sonoran life-zone. No mainland record south of about latitude 30°, but occurs on certain islands south nearly to 28°. First reported by Belding (1883*a*, p. 531) from Cedros Island, in April; Bryant (1886, p. 64, under the name *Trochilus anna*) reported finding it on the same island in January, as did Townsend (1923, p. 16) in March. There are several more or less definite records for Guadalupe Island as follows: by Bryant (1887*a*, p. 292), in March; by Thayer and Bangs (1908, p. 105), in June; and by Anthony (1925, p. 297), in July. Kaeding (1905, p. 134) and Howell (1912, p. 190) found this species on Todos Santos Islands in March and April. Osburn (1909, p. 137) found it on Los Coronados Islands in early April, and Howell (1917, p. 63) on the same islands, May 17. On the mainland, the Anna Hummingbird is common and well known from San Quintín, where it nests (Bendire, 1895, p. 207), north to the United States boundary. It nests on the western side of the Sierra San Pedro Mártir at least up to 2700 feet altitude (as at Valladares), and individuals have been found after the breeding season as high as La Grulla, 7200 feet (Anthony, 1893, p. 237). The specimens in the Museum of Vertebrate Zoology provide the following data: south end of Valle de las Palmas, January 7, 9, and 11; Todos Santos Islands, January 15; San Ramón, mouth of Santo Domingo River, March 19 and December 28; San Telmo, April 6 and December 1; La Grulla, 7200 feet, Sierra San Pedro Mártir, October 3.

***Selasphorus rufus* (Gmelin)**

Rufous Hummingbird

Fairly common transient through the northern section of the territory. First reported by Bryant (1889*b*, p. 289, under the name *Trochilus rufus*) as taken by Anthony at San Quintín during migration. The southernmost record station to date is Cedros Island, where a specimen was taken by W. W. Brown, March 30, 1906 (Thayer and Bangs, 1907*b*, p. 78). Other records are: Todos Santos Islands, one seen in April, 1910 (Howell, 1912, p. 190); San Quintín, "several" seen between April 26 and May 3, 1910 (Howell, 1911, p. 152); Cocopah Mountains [Colorado desert], seen in February, 1905 (Stone and Rhoads, 1905, p. 682); San Felipe, March 29 (Huey, 1927*d*, p. 28); at sea "off the coast of Lower California," in "summer"[*] (Anthony, 1897*a*, p. 57); La Grulla, 7200 feet altitude, October 2, 1925, and Vallecitos, at 7500 feet, June 23, 1926 [both localities in Sierra San Pedro Mártir] (specimens in Mus. Vert. Zool.).

***Selasphorus alleni* Henshaw**

Allen Hummingbird

Transient, northerly; common at times, but seemingly not regular. The first record, and the southernmost one, is that by Brewster (1902, p. 113) of a specimen taken by Frazar March 11, 1887, "in the Victoria Mountains opposite Carmen Island" [latitude 26°]; I have examined this specimen and verified its determination as *alleni*. Other reported occurrences are: Los Coronados Islands, "quite common" the last of June, 1908, on South Island (Wright, 1909, p. 100), and "very common" April 3 to 10, 1909, on the same islands (van Rossem, 1909, p. 208); Piñón, Sierra San Pedro Mártir [no date] (Ridgway, 1911a, p. 610); Santo Domingo, specimen taken February 22, 1925, and five miles east of San Quintín, seen "commonly" February 25, 1925 (Huey, 1926, p. 355). I know of no good basis for the statement "winters in northern Lower California" (A. O. U. Comm., 1910, p. 204).

***Stellula calliope* (Gould)**

Calliope Hummingbird

Known definitely only from the higher part of the Sierra San Pedro Mártir, where apparently a fairly common summer resident. Life-zone, Canadian. From June 2 to 10, 1925, about a dozen individuals were seen and four specimens (now in Mus. Vert. Zool.) taken by A. E. Borrell, in the neighborhood of Vallecitos, 8500 feet altitude (Grinnell and Lamb, 1927, p. 124). Also in the Museum of Vertebrate Zoology is a skin (no. 47983), adult male taken by C. C. Lamb near Vallecitos, June 19, 1926, which shows hybrid origin, apparently *Stellula calliope* × *Calypte anna*. There is an earlier ascription of the Calliope Hummingbird, to simply "Lower California" (A. O. U. Check-list, 1886, p. 226), but I know nothing of its basis. This may have prompted Belding's (1889a, p. 109) implication that the range of this species extends "south to Lower California."

***Baselinna xantusii* (Lawrence)**

Xantus Hummingbird

Common resident in the Cape district, where found from sea level up to the tops of the highest mountains, though breeding most numerously, perhaps, in the mountains (Upper Sonoran zone); occurs also to the northward of the Cape district proper, sparsely or locally, as far as latitude 29°. First recorded, and the species newly described, by Lawrence (1860a, p. 109, under the name *Amazilia Xantusii*) from Cape San Lucas [San Nicolás, near], with type [no. 16935 in U. S. Nat. Mus.] (a female) taken by John Xantus in October, 1859. Shortly thereafter, Lawrence (1860b, p. 145, under the name *Heliopea edica castaneocauda*) redescribed the species, on the basis of a male [no. 17767 in U. S. Nat. Mus.] taken at "Cape St. Lucas" [really Miraflores, 10 leagues north of] by Xantus, November 26, 1859 [*vide* C. W. Richmond, MS]. Subsequently this species has been dealt with from the systematic standpoint in a great number of monographic or general works. Important special references as pertaining to the Cape district are: Belding (1883b, p. 542, and 1883c, p. 349); Bryant (1891, p. 191); Ridgway (1892, pp. 313, 315, 368, 369); Bendire (1895, p. 226); Brewster (1902, p. 113); Lamb (1925c, p. 89), full account of nesting. All of the published records known to me for the territory north of La Paz are as follows: "I have found them . . . where there was abundance of water, from Comondú as far north as lat. 29°" (Bryant, 1889b, p. 289); common in mountains opposite Carmen Island in latitude 26° (Brewster, 1902, p. 115); many seen in cañon in Sierra Giganta,

east of Loreto, and nesting at Comondú (Lamb, 1925*c*, p. 89); Agua Verde Bay and San Josef Island, specimens (Townsend, 1923, p. 16). Specimens in the Museum of Vertebrate Zoology, collected by C. C. Lamb, bear data as follows: Todos Santos, latitude 23° 25', November 14, 1923; San Ignacio, near latitude 27°, April 21, 1927.

***Tyrannus verticalis* Say**

Western Kingbird

Common summer resident locally in the northern section of the territory, north of latitude 30°. Apparently breeds in life-zones from Lower Sonoran to Transition, inclusively. First reported by Bryant (1889*b*, p. 290) as having been found by Belding at San Quintín in May, 1881. Howell (1911, p. 152) found the species nesting at the same place in 1910. Huey (1926, p. 355) reports it from La Grulla [2200 feet, in the Sierra San Pedro Mártir] in June, and from El Rayo and Laguna Hanson, in the Sierra Juárez, in June and July. There is one authentic insular station of occurrence: Todos Santos Islands, March 10 and mid-April (Kaeding, 1905, p. 134, and Howell, 1912, p. 190). From the Colorado desert, Murphy (1917, p. 91) has recorded this species from the Hardy River, April 1. The record of this species by Kaeding (*loc. cit.*) from Cedros Island, April 1, 1897, is a mistake; for the specimen of those data, in the A. W. Anthony collection (Carnegie Mus.) is *Tyrannus vociferans*. Also Anthony (1893, p. 237) confused or combined these two species under the one name *verticalis*, for specimens he took prove to be *vociferans*. Specimens of *verticalis* in the Museum of Vertebrate Zoology bear the following data: ten miles west of Pilot Knob and one mile south of United States boundary, March 15; El Major, in the Colorado delta, April 24; seven miles east of Cerro Prieto, May 29 and June 6; San Felipe, on the Gulf, April 11; Santo Tomás, 6000 feet, in the southern part of the Sierra San Pedro Mártir, June 4; San José, 2500 feet, latitude 31°, May 22; San Telmo, March 31.

***Tyrannus vociferans* Swainson**

Cassin Kingbird

Common resident in the northwestern section of the territory, where adherent chiefly to the Upper Sonoran life-zone. Of wide occurrence in fall, winter and spring south to the southern tip of the peninsula and on some of the islands. First recorded by Streets (1877, p. 12) from Bay of Santo Tomás [Santo Tomás Anchorage, lat. 31° 33'], specimen taken. Further important records, beginning at the north, are: Los Coronados Islands, in April (van Rossem, 1909, p. 208); "coastal valleys" [west of Sierra San Pedro Mártir], breeding (Huey, 1926, p. 355); San Quintín, June 7 (McLellan, 1926, p. 303) [the identity of the specimen here concerned has been confirmed by H. S. Swarth]; Cedros Island, in April (Belding, 1883*a*, p. 531); Santana [near lat. 28° 40'], March 16 (Thayer and Bangs, 1907*c*, p. 137); Pozo Grande [near lat. 26°] in March (Bryant, 1889*b*, p. 290); Agua Verde Bay [on Gulf side], April 2, Cape San Lucas and San José del Cabo in March (Townsend, 1923, p. 16); Cape region, "common" [in late winter] (Belding, 1883*b*, p. 541); La Paz, "abundant" in February and March, San José del Cabo in August, September and December, San José del Rancho in July (Brewster, 1902, p. 116). There is no confirmation of the supposition that this kingbird breeds in the Cape district. In the Carnegie Museum, A. W. Anthony collection, are two specimens of this species from Valladares [west base of Sierra San Pedro Mártir], March 19 and May 15, 1889, and one from Cedros Island, April 1, 1897. The Museum of Vertebrate Zoology contains specimens from: Santo Domingo, December 3, 4, and 16, and San Ramón, March 16 and 24.

***Myiarchus magister magister* Ridgway**

Arizona Great Crested Flycatcher

Rare transient or vagrant. One record: Specimen obtained at San José del Cabo, April 30, 1923 (Lamb, 1925*d*, p. 117). This specimen I have examined; it is now no. 36559, coll. L. B. Bishop.

***Myiarchus cinerascens cinerascens* (Lawrence)**

Northern Ash-throated Flycatcher

Common summer resident in the northern fourth of the territory, north on both sides from about latitude 30° to the United States boundary; also a few apparently winter in the Colorado delta. Occurs chiefly in the Lower Sonoran life-zone, mesquite and cactus associations; but on the Pacific slope breeds also in Upper Sonoran, chaparral association. First recorded by Bryant (1889*b*, p. 290) as having been found by Anthony "along the northwestern coast" nesting in holes in agave stalks. Anthony, himself (1893, p. 237), records this species from the western slope of the Sierra San Pedro Mártir, and from Guadalupe Valley [lat. 32°], nesting. Anthony further (1895*d*, p. 140) reports it as nesting commonly around San Fernando [lat. 30°]; and he records a specimen [which I have examined] taken there in January. Van Denburgh (1924, p. 70) reports a bird from Todos Santos Islands, May 25. From the Colorado desert, Stone and Rhoads (1905, p. 682, under the name *Myiarchus cinereus*) record this flycatcher from the Cocopah Mountains and elsewhere, in February [but the quoted field notes seem to me badly scrambled as between this species and Western Kingbird!]; Murphy records it from Pattie Basin and south of Mexicali, in April; and Huey (1927*d*, p. 28) reports it from San Felipe, nesting. The series of skins in the Museum of Vertebrate Zoology represents the following localities: Colorado River, twenty and forty miles south of Pilot Knob, October 13 and 21 and February 29; Alamo River, twenty miles southwest of Pilot Knob, January 21, 23 and 31; Las Palmas Cañon, west side Laguna Salada, October 28 to November 8; El Major, in Colorado delta, April 24 and 29; seven miles east of Cerro Prieto, May 27 to June 11; San Felipe, on the Gulf, March 30 to April 13; El Cajón Cañon, east base Sierra San Pedro Mártir, May 15 to June 5; Santo Tomás, 6000 feet, in southern part of Sierra San Pedro Mártir, June 4; Valladares, 2700 feet, April 16; Aguaje del Sauce, 2600 feet, April 30; San Telmo, March 31.

***Myiarchus cinerascens pertinax* Baird**

Lower California Ash-throated Flycatcher

Common resident in the Cape district, and thence northward at least to latitude 28° 30'. Adherent to Arid Tropical and Lower Sonoran life-zones, and chiefly to dry chaparral and cactus associations. First recorded by Baird (1859, p. 301, under the name *Myiarchus mexicanus*), and newly named by the same author (1859, p. 303, under the name *Myiarchus pertinax*), from specimens [type is no. 12944 in U. S. Nat. Mus.] taken by Xantus at Cape San Lucas in May, 1859. Further references of importance are: Cape district generally, "common" (Belding, 1883*b*, p. 541, under *Myiarchus cinerascens*); Pichilique Bay (Streets, 1877, p. 12); La Paz, etc. (Sclater, 1888, p. 249); San José del Cabo, etc. (Brewster, 1902, p. 117); San Francisquito Bay, San Josef Island, and Ceralbo Island (Townsend, 1923, p. 17); Santa Margarita Island (Nelson, 1921, p. 90); Rosarito, San Jabier, and Santana (Thayer and Bangs, 1907*c*, p. 137, under *Myiarchus mexicanus pertinax*). The last three localities, about latitude 28° 30', are the

northernmost for good *pertinax*; from there to latitude 30°, intergradation with the race *cinerascens* probably takes place. Specimens of *pertinax* are in the Museum of Vertebrate Zoology from: San Ignacio, April 15 to May 17; San Lucas, on the Gulf, latitude 27° 14', May 10; La Paz, October 8; Santa Anita, June 6.

***Sayornis phoebe* (Latham)**

Eastern Phoebe

Rare vagrant. One instance of occurrence: San Ignacio, near latitude 27°, one shot from tip of willow stub in creek bottom, March 19, 1928; specimen (♀, no. 11922, coll. San Diego Soc. Nat. Hist.) examined by me, and here recorded by permission of Mr. L. M. Huey, who obtained it.

***Sayornis saya saya* (Bonaparte)**

Rocky Mountain Say Phoebe

Winter visitant, rather sparingly as to numbers (save at the extreme north) but extensively, clear to the southern tip of the peninsula. Also permanently resident in the Colorado desert district. First recorded [most probably this subspecies] by Belding (1883*b*, p. 541, under the name *Sayornis sayi*) from the Cape region where "rare." Bryant (1886, p. 64) found the species in small numbers on Cedros Island in January. Townsend (1923, p. 17) records it from Cedros Island in March and from Cape San Lucas, March 24. Lamb (1927*a*, p. 70) found it on Natividad Island in December, and (MS) at San José del Cabo in winter rarely, up to March 13. Brewster (1902, p. 118) records three specimens taken at La Paz in February [15, 23 and 24, 1887]; these I have examined and found to be *S. saya saya*, restrictedly. At the north, Stephens (1921, p. 97) has reported the species from Los Coronados Islands in March; and there are specimens in the Museum of Vertebrate Zoology from Todos Santos Islands, January 13 to 15, and from Tecate, January 22. Price (1899, p. 92) and Stone and Rhoads (1905, p. 682) report the species from the Colorado delta in winter, but which subspecies was represented it is not now possible for me to determine.

***Sayornis saya quiescens* Grinnell**

San José Say Phoebe

Fairly common resident locally in the northern section of the peninsula, at least from about latitude 30° north nearly or quite to the United States boundary; more widespread in winter, even to the Colorado delta. Life-zone, Upper and Lower Sonoran. First recorded [undoubtedly this race] by Bryant (1889*b*, p. 290, part, under the name *Sayornis saya*) as found by Anthony nesting at Valladares, and as found by Belding at San Rafael [25 miles east of Ensenada] in May. Anthony (1893, p. 237, and 1895*d*, p. 140) corroborates the above and also reports the species nesting around San Fernando. I have examined a specimen (in Carnegie Mus.) taken by Anthony at San Quintín, December 20, 1887. Belding (1883*a*, p. 531, under the name *Sayornis sayi*) found Say Phoebes on Cedros Island the latter part of April, "paired"; and Anthony (1925, p. 297) obtained a "young male" there August 8, and saw other individuals. There is thus strong evidence of breeding on that island; Anthony's bird, a full-grown juvenal, I have examined and identified as of the present race, just as his critical comments indicate. Of course, there is the chance that the wintering Say Phoebes reported from that island are of this race, too, rather than the migratory *S. saya saya*. The present subspecies was described under the name *Sayornis sayus quiescens* by Grinnell (1926*e*, p. 180) with type [no. 46260 in Mus. Vert. Zool.]

from San José, 2500 feet altitude, near latitude 31°, collected by himself, September 27, 1925. Specimens of this race, now in the Museum of Vertebrate Zoology, come from the following additional localities on the Pacific slope: near shore of Santa Rosalia Bay, west of Trinidad Peak, May 31, 1927 (a full-grown juvenile); Arroyo Nuevo York in December; Santo Domingo in December; San Telmo in March; El Valle de la Trinidad in November and December; Rancho Ojos Negros in November; Todos Santos Islands in January; south end of Valle de las Palmas in January; and five miles south of Monument 258 in December. From the Gulf slope of the peninsula the Museum has skins from: El Cajón Cañon at 3200 feet, east side of Sierra San Pedro Mártir, in May; San Felipe, on the Gulf, in March and April (nesting here, according to Huey, 1927*d*, p. 29); Las Palmas Cañon, west side of Laguna Salada, in November; near Cerro Prieto in February; Álamo River, twenty miles southwest of Pilot Knob, in January; and Colorado River, twenty miles south of Pilot Knob, in October.

***Sayornis nigricans salictaria* Grinnell**

San Quintín Black Phoebe

Common resident locally in the northern, basal section of the peninsula from about latitude 30° north to the United States boundary; breeds chiefly on the Pacific slope, but occurs also, at least in winter, in the Colorado delta. Life-zone mainly Upper Sonoran. Adheres closely to riparian and littoral associations. What was undoubtedly this race of Black Phoebe was first recorded by Bryant (1889*b*, p. 290, under the name *Sayornis nigricans*) as found by Belding "between Tia Juana and San Pedro Martir," and by himself at San Fernando, nesting. Anthony (1893, p. 238, and 1895*d*, p. 140, in both places under the name *Sayornis nigrescens*) reports his finding the species at San Fernando and on the west side of the Sierra San Pedro Mártir "common along all of the water courses" up to 3000 feet altitude and one pair nesting at La Grulla [7200 feet, and thus in the Transition zone]. It has been recorded repeatedly from Todos Santos Islands, beginning with Kaeding (1905, p. 135), and from Colnett by Willett (1913, p. 23). Other published records of the Black Phoebe which probably pertain to this subspecies are: Price (1899, p. 92) from lower Colorado River, in December; Stone and Rhoads (1905, p. 682) from mouth of Hardy River, in February; Baneroff (1922, p. 98) from Don Lorenzo, southeast of Mexicali, in January; Huey (1927*d*, p. 29, under *Sayornis nigricans semiatra*) from San Felipe, on the Gulf, April 17. The subspecies was newly described by Grinnell (1927*a*, p. 68), with type [no. 46262 in Mus. Vert. Zool.] from San José, 2500 feet altitude, near latitude 31°, where taken by himself, October 23, 1925. Specimens in the Museum of Vertebrate Zoology represent the following localities: Todos Santos Islands, January; Rancho Ojos Negros, November; El Valle de la Trinidad, November and December; San José, September and October; San Ramón, March; five miles south of Monument 258, December; south end of Valle de las Palmas, January; five miles east of Cerro Prieto, February 6; Álamo River, twenty miles southwest of Pilot Knob, January 20, 21 and 31; Colorado River, twenty miles south of Pilot Knob, October 13 and 14; Colorado River at latitude 32° 15', February 29 and March 2; San Felipe, on the Gulf, April 12.

***Sayornis nigricans brunneescens* Grinnell**

San Lucas Black Phoebe

Fairly common resident locally of the Cape district, and occurs thence north nearly to latitude 29°, near which intergradation with the next race to the north-

ward takes place. Baird (1859, p. 303, under the name *Sayornis nigricans*) first reported the Black Phoebe from the Cape district, as taken at Cape San Lucas by Xantus. Belding (1883*b*, p. 542) found it there, though "rare"; but Brewster (1902, p. 119) records a large series of specimens taken by Frazer "from San José del Cabo on the coast to the summit of the Sierra de la Laguna"; he also reports the species from Triunfo. Belding (1889*b*, p. 290, part) reports it nesting at Comondú; and Thayer and Bangs (1907*c*, p. 137) record specimens from Santana [lat. 28° 40']. This subspecies was newly named by Grinnell (1927*a*, p. 69), with type [now no. 216739 in Mus. Comp. Zool.] taken by M. A. Frazer at San José del Cabo, October 11, 1887. I have examined specimens in the Thayer collection, definitely of the present race, from Miraflores, El Sauz, Eureka, San José Island (June 19), and Santana (March 11, 16 and 20). A series of skins is in the Museum of Vertebrate Zoology from San Ignacio, obtained April 12 to May 3, 1927, by C. C. Lamb.

***Nuttallornis mesoleucus majorinus* Bangs and Penard**

Greater Olive-sided Flycatcher

Common summer resident, only at the north, on the Sierra San Pedro Mártir and the Sierra Juárez. Life-zone, Transition and Canadian; association, coniferous forest. Migrant over the adjacent lowlands. First reported by Bryant (1889*b*, p. 291, under the name *Contopus borealis*), but second-hand and not quite accurately, from information furnished by Belding and Anthony. Belding, himself (1890, p. 96), says that he found it "common" at Hansen's [Laguna Hanson], "May 10-12 (1884)," and that "a single migrant" was shot at "Tia Juana, April 30, 1885." Anthony (1893, p. 238) records the species as found by him [in May] "abundant throughout the pine belt" on the Sierra San Pedro Mártir. More recent explorations fully confirm these early ascriptions, specimens being contained in the Museum of Vertebrate Zoology as follows: Vallecitos, 7500 to 8500 feet, June 2, 6 and 23; La Encantada, 7500 feet and above, May 29 and 30; La Grulla, 7500 feet, May 13; Valladares, 2700 feet, April 23 (probably only a transient here); Colorado delta at a point seven miles east of Cerro Prieto, June 14 (late transient). Hellmayr (1927, p. 189) uses the name *Nuttallornis mesoleucus* (Lichtenstein) for the Olive-sided Flycatcher and includes Lower California within the range of the species.

***Myiochanes virens richardsoni* (Swainson)**

Western Wood Pewee

Common summer resident on the Sierra San Pedro Mártir, where inhabits the coniferous forest association in the Transition and Upper Sonoran life-zones. Occurs as a transient at low levels elsewhere in the northern section of the territory, north of latitude 28°. First reported by Bryant (1889*b*, p. 291, under the name *Contopus richardsoni*) as found by Belding [in May, so probably in migration] at "several localities between Tia Juana and San Pedro Martir," by Anthony on the Sierra San Pedro Mártir, and by himself at San Sebastián [lat. 28° 30']; at the latter point a specimen was taken April 29, 1889, thus doubtless a transient and marking the southernmost known station for this race. Other records are: Sierra San Pedro Mártir, nesting (Anthony, 1893, p. 238); Colnett, April 8 (Willett, 1913, p. 23, under *Myiochanes richardsoni richardsoni*); Todos Santos Islands, April 18 and between May 24 and 30 (Howell, 1912, p. 190, and Van Denburgh, 1924, p. 70); Los Coronados Islands, May 18 (Howell, 1917, p. 65); near Mexicali, April 17 (Murphy, 1917, p. 92). The ascription to the Colo-

rado delta in February (Rhoads, 1905, p. 690) seems to me well-nigh impossible! The series of *richardsonii* in the Museum of Vertebrate Zoology represents the following localities: Vallecitos, 7500 to 8500 feet, Sierra San Pedro Mártir, June 1 to 17; La Grulla, 7500 feet, May 27; Santa Rosa Flats, May 31; Valladares, 2700 feet, April 19; Colorado delta at a point seven miles east of Cerro Prieto, May 23 and June 4 (transient).

***Myiochanes virens peninsulae* (Brewster)**

Large-billed Wood Pewee

Common summer resident on the Sierra de la Laguna, in the Cape district; life-zone, Upper Sonoran. First recorded, and the subspecies newly described, by Brewster (1891, p. 144, under the name *Contopus richardsonii peninsulae*), with type [now no. 216790 in Mus. Comp. Zool.] taken by M. A. Frazar on the Sierra de la Laguna, May 9, 1887. Subsequently, Brewster (1902, p. 120) reports the species as found commonly down to the "base" of those mountains, as well as at Triunfo and San José del Rancho. A specimen in the Museum of Vertebrate Zoology was taken by C. C. Lamb at Todos Santos, latitude 23° 27', November 13, 1923. Oberholser (1899c, p. 333) comments upon the systematic status of this race under the name *Horizopus richardsonii peninsulae*, and other authors, for example, Ridgway (1907, p. 525), have used the name *Myiochanes richardsonii peninsulae*.

***Empidonax difficilis difficilis* Baird**

Yellow-bellied Western Flycatcher

More or less common spring and fall transient throughout the entire length of the territory; also a few winter in the Cape district. The first record of a Western Flycatcher most likely of the present race is that of Belding (1883a, p. 531) based on a bird that came aboard boat near Cedros Island in April, 1882. Bryant (1889b, p. 291) records that Belding had further found the species "in wooded cañons north of San Pedro Martir in May, 1885," and that Anthony had found it "during fall migration" at Valladares. While Anthony himself later records only *E. d. cineritius* from the San Pedro Mártir region, I find among his specimens [in the Carnegie Museum] good *difficilis* as follows: no. 19368, San Telmo, April 30, 1893; no. 19367, San Pedro Mártir, May 8, 1893; no. 19369, Valladares, September 6, 1888. These were all doubtless migrants, just as in the following published instances: Los Coronados Islands, in April (Osburn, 1909, p. 137); Hole in the Wall, ten miles southeast of Todos Santos Islands, April 5 (Willett, 1913, p. 23); Laguna Hanson, Sierra Juárez, October 18 (Huey, 1927a, p. 153); San Felipe, in April (Huey, 1927d, p. 29); Santana [lat. 28° 40'], March 18 and 20 (Thayer and Bangs, 1907c, p. 137). Positive Cape district records are: Santiago, November 15, and San José del Rancho in December (Brewster, 1902, p. 120); see also Lamb, 1925d, p. 117. Specimens of *difficilis* are contained in the Museum of Vertebrate Zoology as follows: El Major, in the Colorado delta, April 28; seven miles east of Cerro Prieto, June 6 (a belated transient of course); San Felipe, on the Gulf, April 12; El Cajón Cañon, east base Sierra San Pedro Mártir, May 21 to 27; San José, 2500 feet, September 27; San Antonio Ranch, 2100 feet, on upper Santo Domingo River, April 26, 1925; San Ignacio, April 13 and 18.

***Empidonax difficilis cineritius* Brewster**

San Lucas Western Flycatcher

Common resident in the Cape district, where restricted to the higher mountains (Upper Sonoran life-zone) in summer, but more widely distributed in winter;

also, at the north, summer resident on the Sierra San Pedro Mártir (chiefly Transition life-zone), and transient over the lowlands adjacently and to the southward. The first ascription of, with little doubt, this race to Lower California is that by Cooper [probably Baird *in*] (1870, p. 329, under the name *Empidonax flaviventris*) based on a specimen taken by Xantus at Cape San Lucas. Then Belding (1883c, p. 348, under *Empidonax difficilis*) records the species from the Victoria Mountains, where found by every other collector thereafter. Brewster (1888a, p. 90) newly names the form as a full species, *Empidonax cineritius*, with type [now no. 214136 in Mus. Comp. Zool.] taken by M. A. Frazar at La Laguna, April 27, 1887 [not "May 12, 1887"—*vide* O. Bangs]. Later (1902, p. 122), Brewster records specimens from La Paz and San José del Rancho. Bryant (1889b, p. 291) took specimens of this form at Comondú, in April, at San Benito [lat. 26° 35'—not San Benito Islands as misquoted by Brewster], and on Santa Margarita Island. Townsend (1890, p. 137, and 1923, p. 17) records it from San Josef Island, March 31, Agua Verde Bay, April 2, and Cape San Lucas. Anthony (1893, p. 238, and 1895d, p. 140) records *cineritius* from the Sierra San Pedro Mártir, apparently nesting, and from San Fernando in May. I have examined the Empidonaces in the Anthony collection in the Carnegie Museum and find good *cineritius* as follows: Large series from the Sierra San Pedro Mártir; Valladares, September 6, 1888; San Fernando, May 20, 1894; Rosalia Bay, August 21, 1896. Said to "breed" also at "Hansen Laguna," Sierra Juárez (A. O. U. Comm., 1910, p. 215). The series in the Museum of Vertebrate Zoology represents the following localities: Vallecitos, 7500 to 8500 feet, May 31 to June 23; La Grulla, 7200 to 7500 feet, May 11 to 26 and October 12; San José, 2500 feet, October 19; Valladares, 2700 feet, April 16 and 18; Todos Santos [in the Cape district], September 18.

***Empidonax traillii brewsteri* Oberholser**

Western Traill Flycatcher

Sparingly summer resident at the extreme north, only from latitude 31° northward, so far as known. Life-zones, Upper and Lower Sonoran; association, riparian willow. Transient to the southward. First reported by Bryant (1889b, p. 291, under the name *Empidonax pusillus*), as having been found "at Tia Juana in April and May, and at other places north of San Pedro Martir." Anthony (1893, p. 238) records it as seen in the San Pedro Mártir section "only during migrations"; but the only specimen in his collection [in Carnegie Museum] marked "*pusillus*" [from San Telmo, April 30, 1893] turns out to be *difficilis*. Huey (1926, p. 355) definitely records the present species, under the name *Empidonax traillii traillii*, from Las Cabras [lat. 31°], June 5. Oberholser (1918b, pp. 93, 98) records specimens from Mount Major [Colorado delta], May 24, and from Nachoguero Valley [close to U. S. boundary, Pacific slope], June 1. C. C. Lamb (MS) found this species fairly common among willows in the Colorado delta seven miles east of Cerro Prieto, taking specimens (now in Mus. Vert. Zool.) from May 22 to June 11, 1928. Osburn (1909, p. 137, under *Empidonax traillii*) reports a specimen taken on Los Coronados Islands [North Island], June 4. The record by Howell (1917, p. 66) from the same group of islands applies to the same bird, so is incorrect as to date and place of capture (C. C. Lamb, MS). Townsend (1923, p. 17) records a specimen from San Bernardo Mountain, in the Cape district, taken May 15. The last two cases are doubtless of late migrants.

***Empidonax hammondi* (Xantus)**

Hammond Flycatcher

Rare migrant at the north. All the ascriptions I know of are as follows: Found by Belding "at Tia Juana in April" (Bryant, 1889*b*, p. 292). Bendire (1895, p. 315) says under this heading, "south in winter to Lower California"; but I have no information as to factual basis for this statement. In the U. S. National Museum is a skin (no. 133710) obtained by E. A. Mearns at "Gardner's Laguna," Salton River, Colorado delta, April 18, 1894 (*vide* C. W. Richmond). In the Museum of Vertebrate Zoology are two specimens, of data as follows: no. 48038, San Felipe, April 12, 1926; no. 48039, El Major, in the Colorado delta, April 24, 1926; both collected by C. C. Lamb.

***Empidonax wrightii* Baird**

Wright Flycatcher

Rare transient. Records of definitely this as distinct from the Gray Flycatcher are few, as follows: Found by Belding at Tia Juana in April and May (Bryant, 1889*b*, p. 292, under the name *Empidonax obscurus*, see also Belding, 1890, p. 103); and Lamb (1925*d*, p. 117) reports one authenticated specimen from San José del Cabo, taken April 17, 1923. Townsend (1923, p. 17) records "wrightii" from Cape San Lucas, La Paz, and Santa Cruz Island; but he does not mention *griseus*. Part of the specimens forming the basis of his ascriptions are in the U. S. National Museum, part in the American Museum of Natural History. Through the kindness of Dr. Richmond and Mr. Riley of the former institution, and of Mr. Miller of the latter, these specimens have been re-examined, and they all turn out to be *griseus*. Bendire's (1895, p. 318) ascription of "*Empidonax wrightii*" to Lower California "in winter" very likely also pertains to *E. griseus*, even though he includes an account of the latter as well.

***Empidonax griseus* Brewster**

Gray Flycatcher

Transient or winter visitant the entire length of the peninsula; common in the latter status in the Cape district, where large numbers of fully identified specimens have been obtained from October 29 to April 21. First recorded by Baird (1859, p. 303, under the name *Empidonax obscurus*) as taken at Cape San Lucas by Xantus. Belding (1883*b*, p. 542) records the species as "very common" in the Cape region in winter. Selater (1888, p. 233) records a Xantus-taken specimen from San José del Cabo. The species, *Empidonax griseus*, was newly described by Brewster (1889, p. 87), with type [now no. 216889 in Mus. Comp. Zool.] from La Paz, collected by M. A. Frazar, February 5, 1887. Brewster further (1902, p. 122) records it from Triunfo, San José del Rancho, and San José del Cabo. Specimens were taken by Bryant (1889*b*, p. 292) on Santa Margarita Island in February, and at Comondú in March. A specimen from Santa Cruz Island, taken April 16, and recorded along with others from elsewhere under the name *Empidonax wrightii* (Townsend, 1923, p. 17), turns out to be *griseus*. Thayer and Bangs (1907*c*, p. 137) report two specimens from Santana, March 12 and 14. Ridgway (1907, p. 571) supplies additional localities of occurrence, as follows: Mulegé, San Pablo [lat. 27° 40'], Espíritu Santo Island, and Santa Anita. Specimens are in the Museum of Vertebrate Zoology from: Santo Domingo, latitude 30° 45', December 13; Todos Santos, latitude 23° 27', November 8 and 16; San Nicolás, Cape district [taken by Xantus in 1860]. The name *Empidonax canescens* has also been employed for this flycatcher (Nelson, 1904*a*, p. 80); but see also Nelson, 1907, p. 99.

Pyrocephalus rubinus mexicanus* Selater*Mexican Vermilion Flycatcher**

Occurs the entire length of the territory, as a permanent resident, common in the Colorado delta, less so in the Cape district, and as a sparse transient or winter visitant elsewhere. Breeding zone evidently Lower Sonoran and Arid Tropical, within which the species affects riparian situations. First recorded by Baird, Brewer and Ridgway (1874, III, p. 520, under the name *Pyrocephalus mexicanus*) as found by Xantus nesting at Cape San Lucas. Curiously, Brewster (1902, p. 123) appeared not to be aware of this reference, for he cites only winter occurrences: La Paz, February 3, San José del Cabo in October and November, and Santiago in November. Other records are: Cape region, "one specimen only" (Belding, 1883*b*, p. 542); La Paz (Selater, 1888, p. 214); San José del Cabo, April 22 (Kaeding, 1905, p. 135); Comondú, in March (Bryant, 1889*b*, p. 292); Santana, March 24 (Thayer and Bangs, 1907*c*, p. 137); Las Cabras [lat. 31°], June 4, and Santo Domingo and El Rosario (Huey, 1926, p. 355); lower Colorado River, common in December (Price, 1899, p. 92); mouth of Hardy River and Pescadero Slough (Stone and Rhoads, 1905, p. 683); Hardy River in March and April (Murphy, 1917, p. 92); Don Lorenzo, southeast of Mexicali, in January (Bancroft, 1922, p. 98). The series of skins in the Museum of Vertebrate Zoology, collected by C. C. Lamb, furnishes the following data: Colorado River, twenty and forty miles south of Pilot Knob, October 14 and March 3 and 6; Alamo River, twenty miles southwest of Pilot Knob, January 26; seven miles east of Cerro Prieto, May 28 and June 10; El Major, on the Hardy River in the Colorado delta, April 25; San Ramón, mouth of Santo Domingo River, December 27; San Ignacio, April 16 to May 17.

Otocoris alpestris actia* Oberholser*California Horned Lark**

Common resident locally, practically wherever prairie, meadow-land, or alkali flats occur, south, on the Pacific slope, from the United States boundary to about latitude 29°; occurs also, at least in winter, on certain of the nearby islands, and in summer on the Sierra San Pedro Mártir. Life-zone mostly Upper Sonoran. What was doubtless this subspecies was first recorded from Lower California by Bryant (1889*b*, p. 292, under the name *Otocoris alpestris rubra*) as found by himself near San Quintín, by Belding at San Rafael [east of Ensenada], and by Anthony on the Sierra San Pedro Mártir. Anthony (1893, p. 238, under *Otocoris alpestris chrysolaema*, and also see Bendire, 1895, pp. 341, 347) records specimens from the tops of the San Pedro Mártirs, and from Colnett, as notably darker-colored and hence of a different race from those from San Quintín and San Fernando which he lists under *Otocoris alpestris pallida* (see also Anthony, 1895*d*, p. 140). I have examined Anthony's collections (in Carnegie Mus.) and consider as *actia*, in the presently understood application of that name, the following specimens: 4 from the Sierra San Pedro Mártir, "8500 ft.," May 24, 1893 [these are worn but notably dark-colored, just as Anthony says]; Colnett Mesa, 1, April 29; San Martín Island, 6, March 13, 1897; San Quintín, 1, March 12; San Fernando, 33, January, May and June; Playa María Bay, 1, August 24, 1896; Rosalía Bay, 1, August 18, 1896; San Benito Islands, 13, September 7 and 9, 1896, March 28-31, 1897; Natividad Island, 4, August 3, 1896. Published records of Horned Larks probably also assignable to *actia*, from localities other than the above, are: Cedros Island, March 10 (Townsend, 1923, p. 17); Nachoguero Valley and San Ysidro Ranch [near U. S. boundary] (Oberholser, 1902, p. 849); San Agustín

[near lat. 30°] (Huey, 1926, p. 355). I have examined the bird recorded by Lamb (1927a, p. 70) under the name *insularis* and taken on Natividad Island, December 23, 1924; it is *actia*. Specimens of *actia* are contained in the Museum of Vertebrate Zoology from the following localities: San Ramón, at mouth of Santo Domingo River; Santo Domingo; San Telmo; 2800 feet altitude, near San José, latitude 31°; El Valle de la Trinidad, 2500 feet; five miles south of Monument 258, at the United States boundary.

Otocoris alpestris enertera Oberholser

Magdalena Horned Lark

Common resident locally on open ground in the lower waist of the peninsula, from Santa Rosalía Bay, about latitude 28° 40', south to neighborhood of Magdalena Bay, about latitude 24° 30'; also on certain of the adjacent islands. Life-zone, Lower Sonoran. The first record applying most likely to this subspecies was by Belding (1883a, p. 530, under the name *Otocorys alpestris chrysolæma*) of a flock seen by him April 28, 1882, at Santa Rosalía Bay; there are now in Mus. Vert. Zool. skins from the same place taken May 30 and 31, 1927. Bryant (1889b, p. 292, under the same name) records Horned Larks from Magdalena and Santa Margarita islands. Dwight (1890, p. 154, under *Otocoris alpestris pallida*) records specimens from Santa Rosalía and Magdalena bays. Townsend (1923, p. 17, under *Otocoris alpestris actia*) records the species from San Bartolomé Bay, and from Carmen Island ["seen" only]; and Anthony (1925, p. 297) from Abreojos Point. The subspecies *enertera* was newly named by Oberholser (1907, p. 41) with type [no. 196076 in U. S. Nat. Mus.] taken by E. W. Nelson and E. A. Goldman on the Llano de Yrais, near Magdalena Bay, December 13, 1905. Other records definitely under this name are: Cedros and the San Benito islands, March and April (Thayer and Bangs, 1907b, pp. 78, 81); Rosarito and San Jabier, February and March (Thayer and Bangs, 1907c, p. 137); Natividad Island, "abundant" in midwinter (Lamb, 1927a, p. 70); San Roque Island, April (Huey, 1927f, p. 206); San Ignacio Lagoon, April (Huey, 1927g, p. 240). It will be observed that both *enertera* and *actia* are recorded positively from the same place, in several instances; for example, from Santa Rosalía Bay and from Cedros, Natividad, and the San Benito islands. This can be accounted for by seasonal shifting of populations (partial migration); or else, and the more likely in the majority of instances, intermediates between the two forms are concerned, of so nearly equivocal nature that they have been referred to one subspecies on quite as good ground as to the other.

Otocoris alpestris leucolaema (Coues)

Desert Horned Lark

Rare midwinter visitant at the north, with known instances of occurrence as follows: specimen taken by C. C. Lamb, now in the Museum of Vertebrate Zoology, from El Valle de la Trinidad, 2500 feet altitude, latitude 31° 20', December 3, 1926 (Grinnell and Lamb, 1927, p. 124); a series in the same Museum taken by C. C. Lamb on the Alamo River, twenty miles southwest of Pilot Knob, January 23 to 28, 1928.

Otocoris alpestris leucansiptila Oberholser

Yuma Horned Lark

Common resident locally in the Colorado desert, chiefly in open parts of the delta, but also south about the head of the Gulf to about latitude 31°. Life-zone,

Lower Sonoran. Recorded first definitely by Price (1899, p. 92, under the name *Otocoris alpestris arenicola*) from "sandy soil along the lower Colorado" in December. Subsequent records are: Gardners Lagoon, breeding, and Colorado River at Boundary Monument 204 (Oberholser, 1902, p. 864); delta region in February (Rhoads, 1905, p. 690, under *Otocoris alpestris pallida*); "eastern

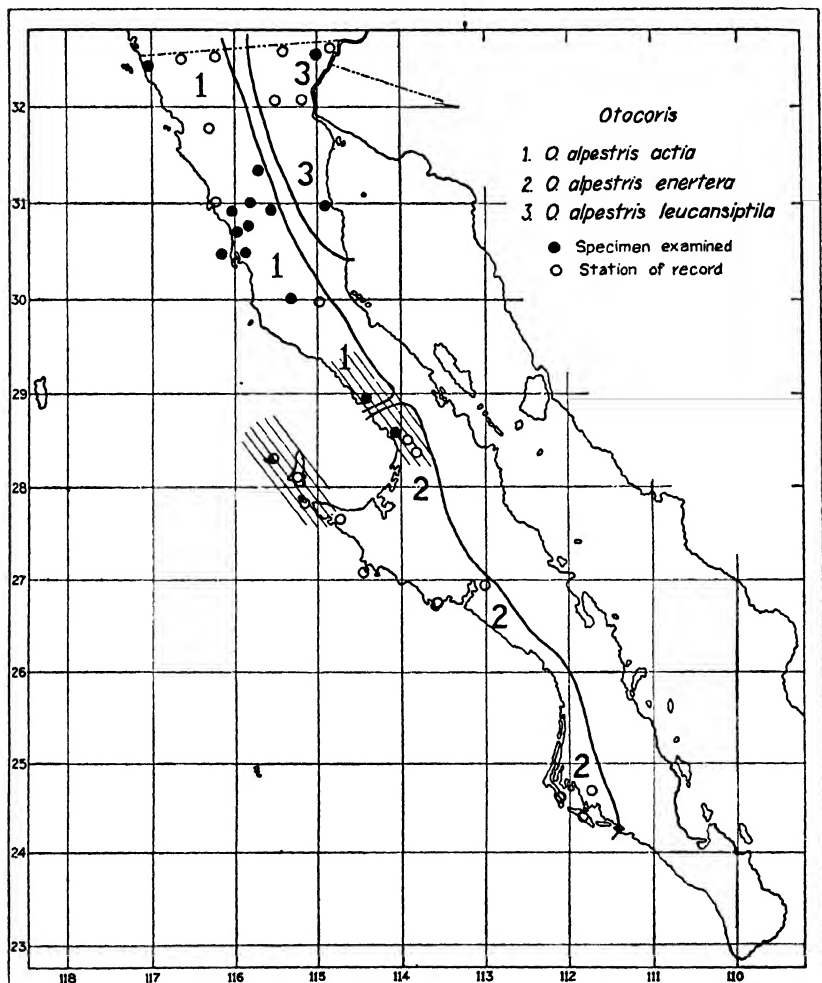


Fig. 8. Breeding ranges of Horned Larks, genus *Otocoris*, in Lower California. Intergradation between races shown by shading.

flanks of the Cocopah Mountains on April 1," and Pattie Basin in April (Murphy, 1917, p. 92); San Felipe, April 8 (Huey, 1927*d*, p. 30 [specimen examined by me]). A series in the Museum of Vertebrate Zoology was obtained in January on the Alamo River, twenty miles southwest of Pilot Knob.

In the original description of *Otocoris alpestris pallida* (Dwight, 1890, p. 154), this form is ascribed to "Lower California and Sonora." The type, not here definitely designated, is shortly afterward stated (Townsend, 1890, p. 138) to

have been obtained "near mouth of Rio Colorado, Sonora." Even at the time of Oberholser's (1902, p. 863) "Revision," there were no positive records of *pallida* outside of Sonora; Dwight's Lower Californian localities prove to concern other races, *enertera* in part, *actia* in part. And, to date, there has been no authenticated record of *pallida*, as defined by Oberholser, for Lower California.

Moreover, after reviewing the literature, as well as all available specimens (including the "type" of *pallida*, no. 117679, U. S. Nat. Mus., "Direction Hill, between Adair Bay and mouth of Rio Colorado," Sonora, March 26, 1889, C. H. Townsend), I am not now at all sure that *pallida* and *leucansiptila* are really distinct, in which case one of these names would have to fall into synonymy. But a recent development is that the name *pallida* is preoccupied; Stresemann (Ornith. Monatsber., 30, 1922, p. 88) shows this and substitutes *Chionophilos alpestris dwighti*. Whether or not *dwighti* (= "*pallida*" proper) applies to a recognizable race, on the Sonoran side of the head of the Gulf, the name *leucansiptila* is thus the one to use in the present connection.

Cyanocitta stelleri frontalis (Ridgway)

Blue-fronted Steller Jay

Recorded definitely only once, from the extreme northwestern corner of the territory: Bryant (1889b, p. 293) states: "Found only by Mr. Belding in the northern part of the peninsula at Valle Palmas, Vallecitos and Guadalupe cañon in May, 1885." These localities are all north of latitude 32° and considerably to the northwestward of the main plateau of the Sierra Juárez, in Upper Sonoran territory where live-oaks occur. It seems probable that a temporary excursion of Blue-fronted Jays took place southward a short distance from western San Diego County, California, just that particular year; for no recent collector has reported finding this species south of the United States boundary. Ridgway (1904, p. 356), the A. O. U. Committee (1910, p. 223) and Nelson (1921, p. 131) all ascribe this jay to the San Pedro Mártirs; but if based primarily on Bryant's statement, as above, they are in decided error, for Belding's localities are far outside the San Pedro Mártir district.

Aphelocoma californica obscura Anthony

Belding California Jay

Common resident in the northwestern section of the territory, chiefly on the Pacific drainage and north of latitude 30°. Life-zone mainly Upper Sonoran; association predominantly with live-oak and chaparral. First recorded, and the subspecies newly named, as above, by Anthony (1889a, p. 75), with type [now no. 17156 in Carnegie Mus.] from Valladares [2700 feet altitude, west base Sierra San Pedro Mártir], where taken by himself, September 8, 1888. Some other recorded stations of occurrence are: vicinity of Ensenada (Bryant, 1889b, p. 293, under the name *Aphelocoma californica*); Santo Domingo (Huey, 1926, p. 355); Hanson Laguna "Mountains" (Swarth, 1918a, p. 410); Sierra San Pedro Mártir, "ranging as high as 10,000 feet" (Anthony, *loc. cit.*). A record from Santana [near lat. 29° 20'] (Thayer and Bangs, 1907c, p. 138) is for an intergrade toward the more southern race *hypoleuca*. Specimens from the northward, vicinity of Ensenada to the U. S. boundary, show tendencies toward the race *californica* of southern Upper California, but are still nearest *obscura*. The series of specimens in the Museum of Vertebrate Zoology represents the following localities: Las Cruces, 2600 feet, east of Ensenada; Nachoguero Valley, 3400 feet; Los Pozos, 4200 feet, and Laguna Hanson, 5200 feet, in Sierra Juárez; El Valle de la Trini-

did, 2500 feet; Vallecitos, 7500 to 8500 feet, Sierra San Pedro Mártir; La Grulla, 7500 feet; Santa Rosa Flats, 6000[?] feet; La Jolla, 6200 feet; Concepción, 6000 feet; Valladares, 2700 feet; San José, 2500 feet; San Antonio Ranch, 2100 feet, upper Santo Domingo River.

***Aphelocoma californica hypoleuca* Ridgway**

Xantus California Jay

Common resident in the Cape district and thence north through the waist of the peninsula as far as latitude 29° 15'. Life-zones, Lower Sonoran and Arid Tropical. Recorded first by Baird (1859, p. 305, under the name *Cyanocitta californica*) as procured by Xantus at Cape San Lucas. Subsequent records are numerous, including the following more important ones: Cape region, "common" (Belding, 1883*b*, p. 541, under *Aphelocoma californica*); Victoria Mountains, "moderately common" (Belding, 1883*c*, p. 348); La Paz, Triunfo, and Sierra de la Laguna (Brewster, 1902, p. 124); Magdalena Island and along "estero" north to San Jorge, and thence northward "as far as lat. 28°" (Bryant, 1889*b*, p. 293); San Ignacio, nesting (Bryant, 1889*a*, p. 24); Santa Margarita Island (Nelson, 1921, p. 90); Santa María Bay on the Pacific side around to Concepción Bay on the Gulf coast. (Townsend, 1923, p. 17); Yubay, Calmallí, San Andrés, San Bruno, and Mulgégé (Oberholser, 1918*g*, p. 480). The subspecies, as above, was newly named by Ridgway (1887*a*, p. 356); type, subsequently designated (Ridgway, 1904, p. 331) [no. 86325 in U. S. Nat. Mus.], from La Paz, where taken by L. Belding, December 18, 1881 [*vide* C. W. Richmond, MS]. Swarth (1918*a*, p. 420) argues for full specific rank; but Oberholser (*loc. cit.*) shows that nearly complete continuity of range, and accompanying intergradation, exists between *hypoleuca* and *obscura*, from about latitude 28° to latitude 30°. Specimens of good *hypoleuca* in the Museum of Vertebrate Zoology represent the following localities: San Ignacio; San Lucas, 27° 14', on the Gulf; La Paz; Todos Santos, 23° 27'.

***Corvus corax sinuatus* Wagler**

Western Raven

Common resident throughout practically the whole extent of the territory. Reported, with very few exceptions, from every place ever visited by a naturalist, both insular and mainland, and from sea level to the summits of the highest mountains. Also this is the bird perhaps most frequently mentioned in the narratives of non-ornithological explorers and tourists, this frequency testifying to both its ubiquity and its conspicuousness. Curiously, there seems to be no formal record up to Belding's (1883*a*, p. 531, 1883*b*, p. 541, and 1883*c*, p. 348, under the name *Corvus corax carnivorus*), from Cedros Island, and from the Cape region, more specifically the Victoria Mountains. The only Lower Californian island which has been reported upon, but from which there appears to be no record of the Raven, is Guadalupe Island (see Anthony, 1925, p. 298). A few of the references of greatest geographic interest are: Bryant, 1886, p. 64; Bryant, 1889*b*, p. 293; Anthony, 1893, p. 239; Brewster, 1902, p. 125; Kaeding, 1905, p. 135; Murphy, 1917, p. 93; Oberholser, 1918*e*, p. 222; Townsend, 1923, p. 18; Huey, 1927*d*, p. 30. The name *Corvus corax clarionensis* Rothschild and Hartert has been used for Lower Californian ravens (Thayer and Bangs, 1907*b*, p. 79, and Oberholser, 1918*e*, p. 222); but I am inclined to agree with Meinertzhagen (1926, p. 102) that this "split" is too fine to make in view of the amount and nature of the geographic variation in *Corvus corax* throughout its entire range. The specimens of the Raven in the Museum of Vertebrate Zoology were obtained at

the following localities: Las Palmas Cañon, west side Laguna Salada; south end of Valle de las Palmas, 1200 feet; Laguna Hanson, 5200 feet, Sierra Juárez; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir; La Grulla, 7500 feet; San Telmo; San Martín Island.

***Corvus brachyrhynchos hesperis* Ridgway**

Western American Crow

Common and probably resident locally in certain valleys on the Pacific drainage north of 32° latitude. Belding informed Bryant (1889*b*, p. 293, under the name *Corvus americanus*) that he had found crows "common in some localities near the [United States] boundary, in winter and late spring" (see also Belding, 1890, p. 113). Recent observers have confirmed Belding's report: Huey (1926, p. 355) saw large flocks at Guadalupe, April 6, 1923; and Lamb (MS) saw several flocks and obtained two specimens (in Mus. Vert. Zool.) near the same place, January 20, 1927. Rhoads (1905, p. 690) thought he saw "crows of some species" in the Colorado River delta in February.

***Nucifraga columbiana* (Wilson)**

Clark Nutcracker

Sparingly resident on the higher parts of the Sierra San Pedro Mártir. Life-zone, chiefly Canadian. First reported by Bryant (1889*b*, p. 293, under the name *Picicorvus columbianus*) as having been found by Anthony, "two individuals at La Grulla." Anthony (1893, p. 239) confirms this; and I have examined the one specimen [in Carnegie Mus.] taken by him April 29, 1889 [as indicated by the data on the label]. Nelson (1921, p. 132) considered the species "rare" on the San Pedro Mártirs. Huey (1926, p. 355) reports it as observed once, June 19, 1923, at La Grulla [7200 feet altitude]. Around Vallecitos, 8000 to 9000 feet altitude, "fairly common" (C. C. Lamb, MS); specimens are in Mus. Vert. Zool. from there, taken May 27, June 1 and 3, 1925.

***Cyanocephalus cyanocephalus* (Wied)**

Piñon Jay

Common, even abundant, resident in the pine belts on the Sierra Juárez and the Sierra San Pedro Mártir. Life-zone, Upper Sonoran and Transition. First recorded by Bryant (1889*b*, p. 293) as found by Belding "abundant" in May, 1884, "in the piñons between Campo [upper California] and Hansen's," and by Anthony "abundant on San Pedro Mártir, at 7,000 to 11,000 [*sic*] feet altitude." The latter statement is confirmed by Anthony himself (1893, p. 239), as also in a general way by every other visitor to the territory specified. Localities represented in the series of specimens in the Museum of Vertebrate Zoology are: Laguna Hanson, 5200 feet, October; Vallecitos, 7500 to 9000 feet, May and June; La Corona, 7500[?] feet, May; La Grulla, 7200 feet, May and October.

***Molothrus ater obscurus* (Gmelin)**

Dwarf Cowbird

Common as a resident in the Colorado Delta region; common throughout the winter in the Cape district; and sparingly present in spring and summer in the northwestern section of the territory north of latitude 30°. Recorded first by Baird (in Cooper, 1870, p. 260, under the name *Molothrus obscurus*) from Cape San Lucas, evidently on the basis of Xantus-taken specimens (see also Baird,

Brewer and Ridgway, 1874, II, pp. 154, 157, under *Molothrus pecoris*). Belding (1883b, pp. 546, 547) records this bird from San José del Cabo, "common" in April but rarely seen in May [up to the 17th]. Brewster (1902, p. 126) reports it from San José del Cabo and Santiago, in autumn, earliest September 30. From the Colorado Desert, Stone and Rhoads (1905, p. 683) record it from "above Colony" and Pescadero Slough, in February, Murphy (1917, p. 93) reports it from Pattie Basin in April, Bancroft (1922, p. 98) from Don Lorenzo, southeast of Mexicali, in January, and Huey (1927d, p. 30) from San Felipe, April 16. There are skins in the Museum of Vertebrate Zoology from El Major and thirteen miles north of El Major, taken April 26, 27 and 29, 1926, from seven miles east of Cerro Prieto, taken May 22 to June 14, 1928, and from the Colorado River, twenty miles south of Pilot Knob, taken October 15 and 22, 1927. From the northwest, Bryant (1889b, p. 294) and Howell (1911, p. 152) report the species from San Quintín, the latter the last of April; but the exact subspecies in these cases is somewhat in doubt. Brewster (1902, p. 126) records a specimen taken at Santiago, November 22, 1887, as "typical" *Molothrus ater*; but I have studied this bird (no. 16374, Brewster coll.) and find it neither *ater* nor *artemisiae*, but a rather large example of *obscurus*, well within the known variational range of that race.

***Molothrus ater artemisiae* Grinnell**

Nevada Cowbird

Oberholser (1917a, p. 328) definitely ascribes this form to Lower California, stating that it "winters south to" the southern portion of that territory. The basis of this record (*vide* H. C. Oberholser *in litt.*) is a specimen (no. 32181, U. S. Nat. Mus.) taken by J. Xantus at Miraflores, November 25, 1861. Howell (1917, p. 71, under the name *Molothrus ater obscurus*) records a specimen taken by L. M. Huey on one of Los Coronados Islands, September 5, 1914, which Dr. Oberholser and I have both examined and identified as *artemisiae*. This bird (no. 322, Huey coll.) is in full juvenal plumage.

***Molothrus ater californicus* Dickey and van Rossem**

California Cowbird

A lone male Cowbird was taken by Mr. C. O. Reis on North Island, Los Coronados group, May 31, 1915, and was recorded (Colburn, 1915, p. 165) under the name *Molothrus ater obscurus*. I have examined the specimen (now no. 50532, Mus. Vert. Zool.) and find it to fall, rather, within the characterizing dimensions, in all respects, of *M. a. californicus*. It was probably a vagrant from the northwestward.

***Xanthocephalus xanthocephalus* (Bonaparte)**

Yellow-headed Blackbird

Locally common as a transient or winter visitant in suitable places clear to the southern extremity of the territory; remains through the summer at the extreme northeast, in the Colorado delta, and small numbers nest there (C. C. Lamb, MS). First recorded by Baird, Brewer and Ridgway (1874, II, p. 168, under the name *Xanthocephalus icterocephalus*) from Cape San Lucas, probably from a Xantus-taken specimen, though I have found no conclusive evidence to support this suggestion. Belding (1883b, p. 546) reports the species as found by him at San José del Cabo, "rare" in April. Brewster (1902, p. 127) says that Frazar found it at San José del Cabo, Santiago, and La Paz "only in autumn, winter, and early spring." As reported by Bryant (1889b, p. 294),

Anthony considered it "very common" along the northwestern coast "during migrations." Murphy (1917, p. 94) reports "great flocks" April 26 on the Hardy River, near Volcano Lake, in the Colorado delta. The Museum of Vertebrate Zoology has received specimens taken May 23 to 31, 1928, seven miles east of Cerro Prieto.

***Agelaius phoeniceus sonoriensis* Ridgway**

Sonora Red-winged Blackbird

Common resident in the Colorado Delta, and sparingly winter visitant south of there, clear to the Cape district. The Red-winged Blackbird was first recorded from Lower California by Baird (1859, p. 305) from San José del Cabo, doubtless Xantus-collected (see also Baird, Brewer and Ridgway, 1874, II, p. 160, under the name *Agelaius phoeniceus*). Ridgway (1902, p. 337) and Brewster (1902, p. 127) almost simultaneously referred Cape-district birds to the race *sonoriensis*. I have recently examined the six Brewster specimens, and verified this determination. Also I have seen three examples taken at San José del Cabo, March 17 and April 5, 1923, which are *sonoriensis* (see Lamb, 1927b, p. 157). Brewster (*loc. cit.*) records that Frazar saw Red-winged Blackbirds at San José del Cabo first on August 28, 1887, and twice subsequently; in November he saw them twice at Santiago. Belding (1890, p. 120) considered it "rare in winter" in the vicinity of Cape San Lucas. From the Colorado Delta, every naturalist visiting that territory, south to the mouth of the Hardy River, has reported the species numerous, no matter what the time of the year: see Price, 1899, p. 92, under the name *Agelaius phoeniceus longirostris*; Stone and Rhoads, 1905, p. 683; Murphy, 1917, p. 94; Bancroft, 1922, p. 98. Huey (1927d, p. 30) records this race from San Felipe, April 19. The Museum of Vertebrate Zoology has skins of good *sonoriensis* from El Major, on the Hardy River, taken April 24 to 26, from thirteen miles north of El Major, April 29, from the Colorado River, twenty miles south of Pilot Knob, October 16 to 23, from the Colorado River at latitude 32° 15', February 28 to March 5, from near Cerro Prieto, February 6, 10 and 23, and June 1 and 4, and from San Felipe, on the Gulf, April 13.

***Agelaius phoeniceus neutralis* Ridgway**

San Diego Red-winged Blackbird

Common resident locally in the northwestern section of the territory, north from latitude 30° and altogether on the Pacific drainage. Recorded first by Bryant (1889b, p. 294, under the two names *Agelaius phoeniceus* and *Agelaius gubernator*), from "the northwest coast" and as found by him nesting at El Rosario. The latter remains the southernmost known station of occurrence for this race. Willett (1913, p. 23) records it from Colnett; van Rossem (1926b, p. 220) from El Rayo, in the Sierra Juárez; and Ridgway (1902, p. 340) from Tecate, near the United States boundary [Ridgway's "Seven Wells" is, I think, likely a mistake for this subspecies]. The series of specimens in the Museum of Vertebrate Zoology represents the following localities: Tecate; Laguna Hanson, 5200 feet; Rancho Ojos Negros, 2200 feet; El Valle de la Trinidad, 2500 feet; San José, latitude 31°, at 2300 feet; San Telmo; Colnett; San Ramón, at mouth of Santo Domingo River.

***Agelaius tricolor* (Audubon)**

Tri-colored Red-winged Blackbird

Fairly common resident locally in the northwestern section of the territory, north from about latitude 30°. Recorded first by Bryant (1889b, p. 294) who quotes Anthony as follows: "Rather common along the northwest coast, breeding

in all fresh water marshes." Bryant also states that Belding found a large colony in San Rafael Valley [east of Ensenada] "nesting in tules, May, 1885." Thayer and Bangs (1907c, p. 139) report a specimen from El Rosario, November 11; Howell (1911, p. 152) records the species from San Quintín the last of April; and Huey (1926, p. 356) reports "a dozen males" from San Antonio del Mar [lat. 31° 7'], March 2. In the A. W. Anthony collection, Carnegie Museum, is a specimen from Carriso Valley [near the U. S. Boundary], April 4, 1894.

Sturnella neglecta Audubon

Western Meadowlark

Common resident locally in the northwestern section of the territory, breeding south on the Pacific drainage nearly to 30° latitude. Occurs scatteringly elsewhere as a winter visitant, south clear to the Cape district; numerous at that season in the Colorado delta. Recorded first by Belding (1883a, p. 531) from Cedros Island, "one or two" in April, and by the same author (1883c, p. 351) from the region south from La Paz, "rare." Bryant (1887a, p. 293, under the name *Sturnella magna neglecta*) records a bird seen on Guadalupe Island, March 22, 1886, the only known occurrence on that island. Another island station is Todos Santos Islands, "a few seen" March 10 (Kaeding, 1905, p. 135). From the Cape district, Brewster (1902, p. 128) reports the species from San José del Cabo and Santiago, arriving at the former place October 14; and Lamb (1927b, p. 157) reports it from San José del Cabo, February 24, and from El Oro, February 1. To the northward, Bryant (1889b, p. 294) records it as heard along the "estero" about seventy miles north of Magdalena Island, and one taken at Pozo Grande [near lat. 26°, in March]; also from near San Quintín and San Rafael [east of Ensenada]. Thayer and Bangs (1907c, p. 139) record specimens from Rosario in November and from Rosarito and San Jabier in February and March. Anthony (1895d, p. 140) found it "not uncommon" in winter at San Fernando; also (see Bendire, 1895, p. 464) he took a set of eggs at San Quintín. Other occurrences north from San Quintín are plentifully known. Meadowlarks are also well known, at least as present from December to March, in the Colorado delta (see Price, 1899, p. 92, Stone and Rhoads, 1905, p. 683, and Murphy, 1917, p. 94). The skins in the Museum of Vertebrate Zoology come from the following localities: Todos Santos Islands [January 13]; Nachoguero Valley, 3400 feet; El Valle de la Trinidad, 2500 feet; San José, 2500 feet, latitude 31°; San Telmo; Colorado River at latitude 32° 15' [March 1]; seven miles east of Cerro Prieto [March 7].

Icterus parisorum Bonaparte

Scott Oriole

Common resident of the Cape district, and occurring thence northward at one season or another, clear to the United States boundary. Breeds at the north mainly in the Upper Sonoran zone of the mountains, but, southerly, also in the Lower Sonoran. Not known to remain through the winter north of about latitude 30°. First recorded by Baird (1859, p. 305) as taken by Xantus at Cape San Lucas (see also Baird, Brewer and Ridgway, 1874, II, pp. 183, 188, 189). Some of the other ascriptions to the Cape district are: generally distributed, possibly most numerous in summer, and breeding in vicinity of Triunfo (Brewster, 1902, p. 128); Victoria Mountains to as high as 4500 feet (Belding, 1883c, p. 348); San José del Cabo (Kaeding, 1905, p. 135); Miraflores (Townsend, 1923, p. 18). Records from the waist of the peninsula are: San Borgia and Ubi (Bryant, 1889b, p. 295); Santana (Thayer and Bangs, 1907c, p. 139); San Andrés Ranch,

near Playa María Bay (Nelson, 1921, p. 29); Rancho Mesquital, 33 miles west of Calmallí (Mus. Vert. Zool.). From the northern portion of the territory the more important records are: near Tia Juana, juniper-covered mesas between San Rafael and the Sierra San Pedro Mártir, and between Campo [upper California] and "Hansen's," in May (Belding, 1890, p. 125, and Bryant, *loc. cit.*); El Valle de la Trinidad in July (Huey, 1928*a*, p. 159); San Fernando, both nesting and wintering (Anthony, 1895*d*, p. 140, and Bendire, 1895, p. 472); Tia Juana River in April, and foothills east of San Quintín in January (Anthony, 1894*b*, pp. 327-328); five miles northeast of San Quintín in February (Huey, 1926, p. 356); San Felipe, on the Gulf, nesting (Huey, 1927*d*, p. 31, also specimens in Mus. Vert. Zool. taken April 3, 1926). There is no known occurrence on any of the islands.

***Icterus cucullatus nelsoni* Ridgway**

Arizona Hooded Oriole

Common summer resident in the northern section of the territory, north from about latitude 28°. Breeds also, possibly, on Cedros Island. Life-zone chiefly Lower Sonoran; locally, on the Pacific slope, Upper Sonoran. Frequents palms and sycamores, usually near water. First recorded, doubtless this subspecies, by Bryant (1889*b*, p. 295) from San Fernando, where breeding. Belding (1890, p. 125) had found it "tolerably common" in May, 1885, from "San Diego [upper California] to San Pedro Mountain"; he also reports it from Tia Juana, March 21. Anthony (1893, p. 239) regarded the species as "very common" along the west base of the Sierra San Pedro Mártir and in all the valleys to the westward. This has been corroborated by various subsequent collectors. Anthony-taken specimens are in the Carnegie Museum from Valladares [2700 feet], Ensenada, Guadalupe Valley [lat. 32°], and Carriso Valley [near the U. S. boundary]. Huey (1926, p. 356) records the species from Santo Domingo [lat. 30° 45'] "as early as February 28." Murphy (1917, p. 94) reports it from Pattie Basin, near Caparote Butte, April 12. Three more southern records I have found, by examination of the basic specimens, to belong definitely to the subspecies *nelsoni*: Santana [lat. 28° 40'], March 21 [not "2" as published], 1907 (Thayer and Bangs, 1907*c*, p. 139); Cedros Island, two specimens, April 17 and 18, 1906 (Thayer and Bangs, 1907*b*, p. 79); Cedros Island, June 3, 1925 (McLellan, 1926, p. 306, under the name *Icterus spurius*). Specimens of *nelsoni* are in the Museum of Vertebrate Zoology from the following localities: San José, 2500 feet, lat. 31°, June 10; Valladares, 2700 feet, April 18; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir, May 17, 26 and 27.

***Icterus cucullatus trochiloides* Grinnell**

San Lucas Hooded Oriole

Abundant resident of the Cape district proper and thence north at least, though less typically this subspecies, to latitude 27°. Life-zone chiefly Lower Sonoran, but also Arid Tropical. Said to be less numerous in winter, but there is no other evidence that any of the birds depart from the peninsula. First recorded by Baird (1859, p. 305, under the name *Icterus cucullatus*) as taken by Xantus at Cape San Lucas (see also Baird, Brewer and Ridgway, 1874, II, p. 194, and III, p. 517). Brewster (1902, p. 131, under *Icterus cucullatus nelsoni*) reports at length upon specimens from Triunfo, San José del Rancho, La Paz, and San José del Cabo. Other ascriptions to the Cape district are numerous, and under various names; besides the above: *Pendulinus cucullatus* (Cassin, 1867, p. 60) and *Icterus nelsoni* (Salvin and Godman, 1887, p. 472). The subspecies,

as above, was newly described by Grinnell (1927*a*, p. 70) with type [now no. 216491 in Mus. Comp. Zool.] from Triunfo, collected there by M. A. Frazar, June 24, 1887. From north of the latitude of La Paz, there are the following published records: Santa Margarita Island in January, and Comondú, nesting (Bryant, 1889*b*, p. 295); Agua Verde Bay and Carmen Island (Townsend, 1923, p. 18). There is a series of skins in the Museum of Vertebrate Zoology from San Ignacio and La Paz.

***Icterus bullockii* (Swainson)**

Bullock Oriole

Fairly common summer resident locally in the extreme northern portion of the territory, north of latitude 31°. Occurs thus both on the Pacific drainage and in the Colorado delta. First reported by Bryant (1889*b*, p. 295) as having been observed by Anthony at the north "during migration," and found by Belding "tolerably common from San Rafael [east of Ensenada] northward." In the Carnegie Museum are Anthony-taken specimens from: Carriso Valley, March 29 to April 21; Valle de las Palmas, April 7; and Gato Creek, April 7 (these localities all north of lat. 32°). The southernmost known station of occurrence is: "sycamore filled canyons six miles north of San Vicente" [lat. 31° 20'], several pairs seen June 18 (Huey, 1926, p. 356). Van Rossem (1909, p. 208) records the species, doubtless as transient, from Los Coronados Islands, in early April; see also Howell (1917, p. 72). In the Museum of Vertebrate Zoology are specimens from El Major, in the Colorado delta, taken April 24, 1926, and from a point in the delta seven miles east of Cerra Prieto, taken May 22 to June 14, 1928.

***Euphagus carolinus* (Müller)**

Rusty Blackbird

One record: a male [now no. 15898, Carnegie Mus.] taken at Valladares [altitude 2700 feet, near latitude 31°], December 12, 1888 (Anthony, 1889*c*, p. 86). I have examined this specimen and confirmed its original identification.

***Euphagus cyanocephalus minusculus* Grinnell**

California Brewer Blackbird

Common resident in the northwestern section of the territory, breeding north on the Pacific drainage from about latitude 30°. Extends from sea level to as high as 8500 feet altitude on the Sierra San Pedro Mártir, but nests chiefly in the Upper Sonoran and Transition life-zones. Occurs also as a winter visitant, south scatteringly clear to the Cape district. Recorded first by Belding (1883*b*, pp. 546, 547, and 1890, p. 128, under the name *Scolecophagus cyanocephalus*) from San José del Cabo and La Paz, in winter ["breeding" is evidently a mistake]. Reported from the same places, sparingly in October and February, by Brewster (1902, p. 133). Bryant (1889*b*, p. 295) records the species from the "San Julio plain east of Comondú" in March, and from San Ignacio "the middle of April." Huey (1926, p. 356) reports one bird, April 14, from Santa Catarina Landing; and Thayer and Bangs (1907*c*, p. 139) record three specimens from Rosario in November. Anthony (1895*d*, p. 140) thought the species to be nesting at San Fernando, the southernmost established station for summering. Anthony further (1893, p. 239) reports it nesting at La Grulla [7200 feet altitude] on the Sierra San Pedro Mártir, and at San Vicente [lat. 31° 20']. Belding (1890, p. 128) records it from San Rafael [east of Ensenada] in May, and from south of Campo [upper California] toward "Hansen's"; and Huey (*loc. cit.*) reports it as

common in the Sierra Juárez. The series of specimens in the Museum of Vertebrate Zoology represents the following localities: Nachoguero Valley, 3400 feet, November; Laguna Hanson, 5200 feet, October; El Valle de la Trinidad, December; Vallecitos, 7500 to 8500 feet, June; La Grulla, 7200 feet, May and October; San Telmo, March; San Ramón, mouth of Santo Domingo River, March and December; San Ignacio, April 19.

***Carpodacus purpureus californicus* Baird**

California Purple Finch

Common winter visitant locally in the northwestern section of the territory, altogether on the Pacific drainage. Also breeds, perhaps sparingly, on the Sierra Juárez. First recorded by Huey (1926, p. 356): a "breeding" bird taken at El Rayo, Sierra Juárez, July 7, 1924; also "a few" found at Santo Domingo "in late February, 1925." A series of specimens in the Museum of Vertebrate Zoology represents the following localities: Los Pozos and Laguna Hanson, in the Sierra Juárez, October 18 to 28; Las Cruces, 20 miles east of Ensenada, December 29 to January 8; El Valle de la Trinidad, December 14; and San Ramón, March 19. The latter locality, latitude 30° 45', is the southernmost station.

***Carpodacus cassinii* Baird**

Cassin Purple Finch

Common resident on the higher parts of the Sierra San Pedro Mártir. Recorded first by Anthony (1893, p. 239) as "not uncommon on San Pedro in the pines. . . ." In the Carnegie Museum is a single Anthony-taken specimen, "San Pedro Mártir (8200 ft.)," taken May 19, 1893. Nelson (1921, p. 132) cites this species as serving to show an "infusion" of the Canadian Zone on these mountains. A considerable series of specimens is now contained in the Museum of Vertebrate Zoology from the vicinity of Vallecitos, 7500 to 9000 feet, and La Grulla, 7200 to 7500 feet, taken in May and June. There is one instance of occurrence on the Sierra Juárez, at Laguna Hanson, October 25, 1926 (Huey, 1927a, p. 153).

***Carpodacus mexicanus frontalis* (Say)**

California Linnet

Common and widely distributed resident of the northern half of the territory north on the mainland practically continuously from about latitude 28° to the United States boundary; also on the Todos Santos and Cedros islands. Life-zone, chiefly Lower and Upper Sonoran; but occurs in summer over the highest parts of the Sierra San Pedro Mártir and Sierra Juárez. First recorded, this subspecies, by Belding (1883a, p. 531, under the name *Carpodacus frontalis rhodocolpus*) from Cedros Island. The southernmost mainland locality for linnets definitely identified as *frontalis* is Santana [lat. 28° 40']. (Thayer and Bangs, 1907c, p. 139). Records for this common bird are naturally so numerous that I cite only a few, seemingly the most important ones, as follows: Todos Santos Islands (Howell, 1912, p. 190, under the name *Carpodacus mexicanus clementis*, and several other authors); Cedros Island (Bryant, 1886, p. 64, *et al.*); San Fernando (Anthony, 1895d, p. 140); Sierra San Pedro Mártir (Anthony, 1893, p. 240, *et al.*); Cocopah Major Mountains (Stone and Rhoads, 1905, p. 684); Colorado River bottom (Price, 1899, p. 92, *et al.*). I am aware that linnets from the Todos Santos and Cedros islands have been referred positively to the subspecies *clementis* (as by Ridgway, 1901a, p. 141, and Thayer and Bangs, 1907b,

p. 79). But while I can see certain slight peculiarities in birds from those islands as well as in birds from the adjacent portions of the peninsular mainland, said differences are not at all such as to warrant using the name *clementis* for them. Specimens of *frontalis* are contained in the Museum of Vertebrate Zoology from the following localities: Colorado River, twenty and forty miles south of Pilot Knob; Alamo River, twenty miles southwest of Pilot Knob; near Cerro Prieto; Las Palmas Cañon, west side Laguna Salada; San Felipe, on the Gulf; Valle de las Palmas, 1200 feet; Descanso Bay, latitude 32° 15'; El Valle de la Trinidad, 2500 feet; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir; near Vallecitos, at 7500 feet, Sierra San Pedro Mártir, June 16; La Grulla, 7200 feet, October 13; Valladares, 2700 feet; San José, 2500 feet; San Telmo; Todos Santos Islands; Santo Domingo; Arroyo Nuevo York; San Fernando Mission; Cedros Island.

***Carpodacus mexicanus ruberrimus* Ridgway**

San Lucas Linnet

Abundant resident of the Cape district proper and thence north to about latitude 28° along near which intergradation with *frontalis* takes place. Life-zone, Arid Tropical and Lower Sonoran. First recorded by Baird (1859, p. 304, under the name *Carpodacus frontalis*) from Cape San Lucas, as taken by Xantus (see also Baird, Brewer and Ridgway, 1874, I, p. 468, under *Carpodacus frontalis*, var. *rhodocolpus*). The subspecies was newly described by Ridgway (1887a, p. 391, footnote, under the name *Carpodacus frontalis ruberrimus*), with type, subsequently designated by him (1901a, p. 137) [no. 86286 in U. S. Nat. Mus.], from La Paz, where taken by L. Belding, January 13, 1882 [*vide* C. W. Richmond, MS]. Other noteworthy records are: Cape region in general (Belding, 1883b, p. 537); Triunfo, etc., nesting (Brewster, 1902, p. 134); San José del Cabo, nesting (Kaeding, 1905, p. 135); Comondú, nesting (Bryant, 1889a, p. 23); Santa Margarita Island (Bryant, 1889b, p. 297); Cerralvo Island (Nelson, 1921, p. 91); Miraflores north to Mulegé, and Espíritu Santo and Santa Catalina islands (Townsend, 1923, p. 18); Carmen, Coronados and San Marcos islands (Mailliard, 1923, p. 455); San Pablo Mission (Nelson, 1921, p. 32). The series of *ruberrimus* in the Museum of Vertebrate Zoology comes from: San José del Cabo; San Ignacio; Rancho Mesquital, 33 miles west of Calmallí. The last-named point, latitude 28° 15', is the northernmost authenticated station for the San Lucas Linnet.

***Carpodacus mexicanus clementis* Mearns**

San Clemente Linnet

Common resident on Los Coronados Islands, whence first reported definitely by Grinnell and Daggett (1903, p. 33, under the name *Carpodacus clementis*). Other references are: Wright, 1909, p. 100; Osburn, 1909, p. 137; Osburn, 1911, p. 32; Howell, 1917, p. 74; van Rossem, 1925, p. 176 (critical). I cannot agree with those authors who refer also to *clementis*, linnets from the Todos Santos and Cedros islands; in other words, the name *clementis*, as far as Lower California is concerned, applies only to the linnets of Los Coronados Islands (specimens in Mus. Vert. Zool.).

***Carpodacus mcgregori* Anthony**

McGregor Linnet

Resident on the San Benito Islands, formerly common but now rare; occurs also on the nearby Cedros Island, though not surely breeding, and another species of linnet is dominant there. First recorded, and newly described, by

Anthony (1897b, p. 165) with type [now no. 13984 in Carnegie Mus.] taken by himself on [West?] San Benito Island, September 7, 1896. Other ascriptions to the San Benitos are: McGregor, 1898c, p. 265 (nesting); Ridgway, 1901a, p. 141; McGregor, 1901, p. 13 (variation in color); Kaeding, 1905, p. 135 (thought "practically extinct"); Thayer and Bangs, 1907b, p. 81 (five specimens obtained

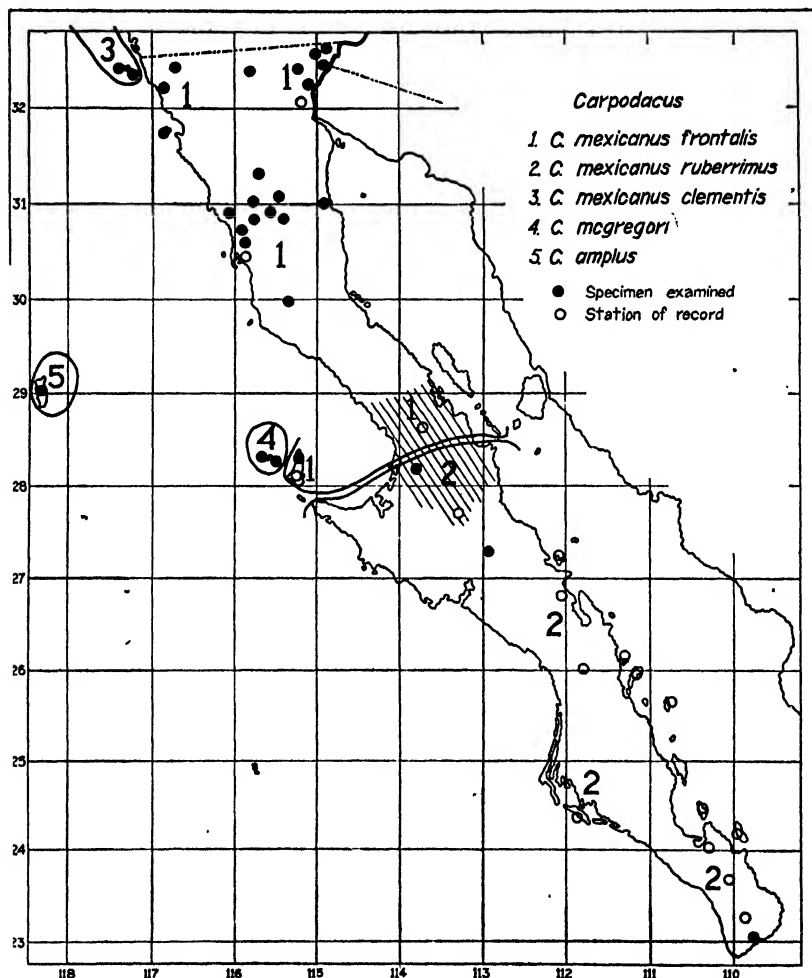


Fig. 9. Breeding ranges of Linnets, part of genus *Carpodacus*, in Lower California. Intergradation between races shown by shading.

April 25 and 26, 1906); Townsend, 1923, p. 18 (West San Benito Island, March 9, 1911); Anthony, 1925, p. 298 (one specimen, August 12-13, 1922). On Cedros Island, Kaeding (1905, p. 135) found this species, April 1, 1897 ("taken" but details not given); and C. C. Lamb (MS) observed two individuals July 22, 1925, and obtained one of them (no. 47769, Mus. Vert. Zool.). Three specimens are also in Mus. Vert. Zool., taken by R. H. Beck, March 9, 1899, on one of the San Benito Islands.

Carpodacus amplus Ridgway

Guadalupe Linnet

Abundant resident on Guadalupe Island, whence first recorded, and newly described, by Ridgway (1876b, p. 187) from specimens taken by Edward Palmer in 1875; the type is no. 70007 in U. S. Nat. Mus., taken February 16 [*vide* C. W. Richmond, MS]. The most important subsequent account of the species is that by Bryant (1887a, pp. 293-296). Other notable references are: Ridgway, 1877, pp. 60-65 (phylogeny); Townsend, 1890, p. 138; Lucas, 1891, p. 220 (osteology); Gaylord, 1897a, p. 42; McGregor, 1898a, p. 80 (nesting); Thoburn, 1899, p. 278; Ridgway, 1901a, p. 142; McGregor, 1901, p. 13; Kaeding, 1905, p. 135; Thayer and Bangs, 1908, p. 105; Townsend, 1923, p. 18; Anthony, 1925, p. 298; McLellan, 1926, p. 307. According to the last report, the Linnet, unlike most of the other endemic birds of Guadalupe, is holding its own as to numbers. Four specimens of this species are contained in the Museum of Vertebrate Zoology taken by (or for) A. W. Anthony in 1896 and 1897.

Loxia curvirostra bendirei Ridgway

Bendire Red Crossbill

A vagrant visitor, putting in appearance sporadically, irrespective of season, wherever coniferous trees afford the proper food. First recorded by Bryant (1887a, p. 297, under the name *Loxia curvirostra stricklandi*) from Guadalupe Island, where he found it in the pine belt in February and March, 1886, and thought it might be nesting. Gaylord (1897a, p. 42) reports it "common" in the same place, September 20, 1896; I have examined the specimens taken that day (in the Carnegie Museum, Anthony collection), and found them positively *bendirei*, and they are in more or less streaked plumage, therefore corroborating Bryant's idea that the species breeds on Guadalupe Island. There is one other record from there: Kaeding (1905, p. 135) reports "a few seen" March 22, 1897; none other of the numerous visitors to Guadalupe has reported it. The A. O. U. Check-list (1910, p. 245) uses the name *Loxia curvirostra* minor to include the Guadalupe Island ascription. To the southward, McGregor (1899b, p. 141) reports a small flock of the "Mexican Crossbill" as found among the pines on Cedros Island, March 13, 1899; a specimen was obtained, but I have been unable to find out where it is now preserved, so that, while very likely *bendirei*, this subspecific determination is not subject to verification. From the mainland, Grinnell and Lamb (1927, p. 124) report the presence of this subspecies at Vallecitos, 8500 feet altitude, Sierra San Pedro Mártir, June 4 to 12, 1925 (specimens in Mus. Vert. Zool.); there was no sign of breeding there.

Loxia curvirostra stricklandi Ridgway

Mexican Red Crossbill

Resident in numbers locally on the Sierra San Pedro Mártir and the Sierra Juárez, where adherent to the pine belts. Life-zone, Canadian and Transition. Adults and young obtained near Vallecitos, 8500 feet altitude, in May and June, and at Laguna Hanson, 5200 feet, in October and July (Grinnell and Lamb, 1927, p. 125, and Huey, 1927a, p. 153, and 1928a, p. 159). A series of specimens from these localities is contained in the Museum of Vertebrate Zoology.

***Spinus tristis salicamans* Grinnell**

Willow American Goldfinch

Fairly common resident locally in the northwestern section of the territory, altogether on the Pacific drainage; evidently most numerous in winter. First recorded by Bryant (1889*b*, p. 298, under the name *Spinus tristis*) as having been found "in winter in Tia Juana valley." Then Belding (1890, p. 136) reports a "large flock" at Tia Juana, April 30. Anthony (1893, p. 240) records that "a few winter" about the west base of the Sierra San Pedro Mártir. Huey (1926, p. 356, under *Astragalinus tristis salicamans*) reports an "immense flock" at the north end of the San Quintín plain [lat. 30° 35'], February 25, and also that he found the species in Las Animas Cañon, ten miles south of Ensenada, June 28. In the Museum of Vertebrate Zoology are specimens from the mouth of the Santo Domingo River near San Ramón, taken March 16 and 21. The record by Ridgway (1901*a*, p. 113) from Cedros Island was a mistake; for it was another species of goldfinch that Belding found there.

***Spinus psaltria hesperophilus* (Oberholser)**

Green-backed Arkansas Goldfinch

Resident, but of interrupted distribution, the full length of the peninsula. Breeds chiefly in the Upper Sonoran life-zone. Winters, in other words, more widely at lower levels. First recorded by Belding (1883*a*, p. 531, 1883*b*, p. 537, and 1883*c*, p. 347, under the name *Astragalinus psaltria*) from Cedros Island, "rare" in April, Cape region, "common" in winter, and Victoria Mountains, a flock in February or March. Other record stations are: Sierra de la Laguna, nesting (Thayer, 1909*a*, p. 11); Sierra de la Laguna and San José del Cabo (Brewster, 1902, pp. 135, 136, using both the names *Astragalinus psaltria* and *A. p. arizonae*); Agua Verde Bay and Mulegé, in April (Townsend, 1923, p. 18, under *Astragalinus psaltria hesperophilus*); Santa Margarita Island in January, and Comondú, nesting (Bryant, 1889*b*, p. 298); San Jabier, March 27 (Thayer and Bangs, 1907*c*, p. 139); Cedros Island, apparently all seasons and nesting (Thayer and Bangs, 1907*b*, p. 79, Anthony, 1925, p. 299, and McLellan, 1926, p. 308); Todos Santos Islands, April (Willett, 1913, p. 23); common resident on lower western slope of Sierra San Pedro Mártir (Anthony, 1893, p. 240); northern 100 miles of Lower California in May (Belding, 1890, p. 137). In the Anthony collection in the Carnegie Museum are specimens from Valladares and Valle de las Palmas. In the Museum of Vertebrate Zoology are specimens from: San Ignacio, latitude 27° 20'; El Cajón Cañon, 3200 feet, east base of Sierra San Pedro Mártir; Vallecitos and La Grulla, 7000 to 8000 feet altitude on those mountains, in May and June; San José, 2500 feet, Valladares, 2700 feet, and Aguaje del Sauce, 2600 feet, at their west base; El Valle de la Trinidad, 2500 feet; Las Cruces, 20 miles east of Ensenada; Laguna Hanson, 5200 feet in the Sierra Juárez; five miles south of Monument 258; south end of Valle de las Palmas, 1200 feet; Álamo River, twenty miles southwest of Pilot Knob.

***Spinus lawrencei* (Cassin)**

Lawrence Goldfinch

Fairly common resident locally in the northwestern section of the territory. Life-zone, Upper Sonoran. Wanders widely in winter, reaching the Colorado delta; but no record, so far, at any season south of 30° latitude. Recorded first by Bryant (1889*b*, p. 298) as found by Belding in the Tia Juana valley. Then

Anthony (1893, p. 240) reported it from the lower western slope of the Sierra San Pedro Mártir. Huey (1926, p. 356, under the name *Astragalinus lawrencei*) records it from La Grulla [7200 feet altitude] on the Sierra San Pedro Mártir, June 14, and he found a flock in February at Rancho Las Escovas on the Llano de San Quintín [about lat. 30° 30'], this being the southernmost known occurrence of the species. Huey (1928a, p. 159) also has found this goldfinch breeding at Laguna Hanson, on the Sierra Juárez. In the Colorado Desert, Price (1899, p. 92) saw "immense flocks" in December on the lower Colorado River, and Stone and Rhoads (1905, p. 684) record specimens from the delta side of the Cocopah Mountains, taken in February. The Anthony collection, in the Carnegie Museum, contains specimens from Valle de las Palmas, taken April 6. The Museum of Vertebrate Zoology contains specimens as follows: Vallecitos at 7500 feet, Sierra San Pedro Mártir, June 22; El Valle de la Trinidad, 2500 feet, November 16; San Ramón, at mouth of Santo Domingo River, March 21; Las Cruces, 20 miles east of Ensenada, December 30; Los Pozos, 4200 feet, Sierra Juárez, October 28; Nachoguero Valley, 3400 feet, November 18 to 29.

***Spinus pinus pinus* (Wilson)**

Northern Pine Siskin

Occurs sparingly as a winter visitant just within the northern border of the territory. Since my published study of siskins of Lower California (Grinnell, 1928a, p. 121), some specimens have come to hand which I am unable to distinguish in any way from siskins from the northern United States and Alaska. These specimens, in the Museum of Vertebrate Zoology, bear data as follows: north end of Nachoguero Valley, 3400 feet, close to United States boundary, November 28 and 29, 1927; Alamo River, twenty miles southwest of Pilot Knob, January 21, 1928. All were collected by C. C. Lamb.

The Pine Siskin was first recorded from Lower California by Belding (1883b, p. 537, under the name *Chrysomitris pinus*, and 1890, p. 139, under *Spinus pinus*), from the Cape district, where he shot one specimen at La Paz "in the winter of 1882." This specimen (no. 86291, U. S. Nat. Mus.) is, through the courtesy of Dr. Wetmore, before me. Its label bears date March 3, 1882, in Belding's handwriting; and it is in rather worn plumage, obviously faded and browned. Even so, the streaking is rather heavy; wing measures 69.8 millimeters (sex not recorded, but probably female). While not decisively determinable, it thus shows characters inclining me to consider it a far vagrant from California or northward, rather than *macropterus*, despite its southern point of capture.

***Spinus pinus macropterus* (Bonaparte)**

Mexican Pine Siskin

Common resident on the higher parts of the Sierra San Pedro Mártir and the Sierra Juárez. Life-zone, Transition and Canadian; association, coniferous forest. Occurs in winter in the adjacent lower country. Anthony was the first to find the species on the Sierra San Pedro Mártir, in May, "well distributed through the pines" (Bryant, 1889b, p. 298, and Anthony, 1893, p. 240, under *Spinus pinus*). The five specimens taken by Anthony were referred by Todd (1923, p. 330) to the race *Spinus pinus macropterus*, with justice, as I have been able to satisfy myself upon study of the large series of siskins now at hand (see Grinnell, 1928a, p. 121). Huey (1926, p. 357) states that this species "breeds in the conifers" on the Sierra Juárez. Specimens in the Museum of Vertebrate Zoology come from Vallecitos, 7500 to 8500 feet, and La Grulla, 7200 feet, on the Sierra San Pedro Mártir, May, June and October; and from Valladares, 2700 feet, April 23.

***Poocetes gramineus confinis* Baird**

Western Vesper Sparrow

Fairly common winter visitant locally south throughout the entire length of the peninsula. First reported by Belding (1883c, p. 350) from La Paz, where "several were shot" in winter (see Bryant, 1889b, p. 298). Then Bryant (*loc. cit.*) records finding this sparrow himself near Pozo Grande and at Llanos de San Julián [near lat. 26°, in March], and that Anthony had noted it not uncommonly "on the northwest coast." Lamb (1925d, p. 118) records specimens taken at El Oro, in the Cape district, in February. Brewster's (1902, p. 137) remarks under *P. g. affinis* apply altogether, I believe, to *confinis*. From the northern end of the territory, Huey (1926, p. 357) records the species from Santo Domingo in February; and Price (1899, p. 92) from the lower Colorado River, in December. In the Museum of Vertebrate Zoology are specimens from: Álamo River, twenty miles southwest of Pilot Knob, January 20 to 31; south end of Valle de las Palmas, January 7 and 11; Santo Domingo, latitude 30° 45', December 4, 14, and 16; San José, latitude 31°, October 19; El Valle de la Trinidad, November and December; San Ignacio, April 15.

***Poocetes gramineus affinis* G. S. Miller**

Oregon Vesper Sparrow

Rare winter visitant into the northern end of the peninsula. The only instances of occurrence known positively to me are attested by four specimens (nos. 46967, -69, -70, -72, Mus. Vert. Zool.) taken by C. C. Lamb at Santo Domingo, latitude 30° 45', December 4, 5 and 14, 1925. Ridgway (1901a, p. 186) gave the winter range of this subspecies as extending south "to Cape St. Lucas"; but, as Brewster (1902, p. 137) points out, Ridgway at that time assumed practically all Vesper Sparrows wintering to the southward along the Pacific coast to be *affinis*. This is evident from his failure to include Lower California within the range of *confinis* at all; and the latter, as we now know, is the regularly wintering form.

***Passerculus sandwichensis alaudinus* Bonaparte**

Western Savannah Sparrow

Common winter visitant on suitable ground throughout the entire length of the territory. First recorded by Ridgway (*in* Belding, 1883b, p. 533, under the name *Ammodramus sandwichensis alaudinus*) as having been obtained by Xantus at Cape San Lucas, September 13 [1859]. Belding (1883c, p. 350, and 1890, p. 143) records it from San José del Cabo and La Paz, in winter. Brewster (1902, p. 137) comments upon the variability shown in his birds from La Paz, Santiago and San José del Cabo (earliest at latter locality, August 27); I have examined his series and find the peculiarities he mentions, but I consider all his specimens as falling quite within the range of *alaudinus*. Other records of presumably this subspecies are, from south to north: San Jorge [lat. 25° 45'], in April (Bryant, 1889b, p. 298); San Bartolomé Bay, March 13 (Townsend, 1923, p. 19); Rosarito, February 25 (Thayer and Bangs, 1907c, p. 139); El Rosario, "as late as" May 16, and Santo Domingo in February (Huey, 1926, p. 357); San Fernando, January (Anthony, 1895d, p. 140); west base of Sierra San Pedro Mártir, in winter (Anthony, 1893, p. 240); Todos Santos Islands, March 10 (Kaeding, 1905, p. 135); lower Colorado River, in December and February (Price, 1899, p. 92, and Stone and Rhoads, 1905, p. 684). In the Carnegie Museum are Anthony-taken specimens of *alaudinus* from San Quintín, April 25, and Carriso

Valley [near the U. S. boundary], March 29. In the considerable series of specimens in the Museum of Vertebrate Zoology, localities are represented as follows: San Ramón, December and March; Santo Domingo, December; Colnett, October 28; El Valle de la Trinidad, November and December; Laguna Hanson, October 13; Tecate, January; Todos Santos Islands, January; five miles south of Monument 258, December and January; south end of Valle de las Palmas, January; Alamo River, twenty miles southwest of Pilot Knob, January.

***Passerculus sandwichensis nevadensis* Grinnell**

Nevada Savannah Sparrow

Winter visitant at the north. The following occurrences are verified by specimens contained in the Museum of Vertebrate Zoology: Colnett, October 29, 1925; five miles south of Monument 258, December 31, 1927 (three skins); south end of Valle de las Palmas, January 7, 1928; El Valle de la Trinidad, December 11, 1926; Alamo River, twenty miles southwest of Pilot Knob, January 25 and 28, 1928; San Felipe, on the Gulf, April 11, 1926. It is likely that a good proportion of the Savannah Sparrows which winter in the Colorado delta belong to the present race.

***Passerculus sandwichensis anthinus* Bonaparte**

Kadiak Savannah Sparrow

Rare winter visitant to the seacoasts northerly. Two attested instances: specimen, no. 47436 in Mus. Vert. Zool., taken by C. C. Lamb near San Ramón, at mouth of Santo Domingo River, March 15, 1925; specimen, no. 38890 in L. B. Bishop coll., obtained on San Luís Island, in the Gulf, March 14, 1926.

***Passerculus beldingi* Ridgway**

Belding Marsh Sparrow

Of common but interrupted residence along the northwestern seacoast, from El Rosario, latitude 30°, north to the United States boundary; also resident on the Todos Santos Islands. Restricted rather closely to the salt marshes, which occur discontinuously. Reported first by Streets (1877, p. 9, under the name *Passerculus savanna anthinus*) from Todos Santos Islands; then by Belding (1883a, p. 528, under *Passerculus anthinus*, and 1890, pp. 144, 145, and 1900, p. 2, under *Ammodramus beldingi*) from San Quintín Bay. Bryant (1889b, p. 299) records specimens from the "salt marsh south of San Quintín." The species is common at Colnett (Willett, 1913, p. 23, and other observers), and on Todos Santos Islands (Kaeding, 1905, p. 135, and Van Denburgh, 1924, p. 71). Other record-stations are: San Ramón (Huey, 1926, p. 357); El Rosario, "breeds freely" (Bancroft, 1927a, p. 56). For critical treatment, see Ridgway, 1885a, p. 516, and Ridgway, 1901a, p. 198. The specimens in the Museum of Vertebrate Zoology represent the following localities: San Quintín; Colnett; Todos Santos Islands.

***Passerculus rostratus rostratus* (Cassin)**

Large-billed Marsh Sparrow

Breeds abundantly in a restricted area at the head of the Gulf of California; there confined to grassy tracts subject to tidal inundation. Recorded thus, definitely, from the vicinity of Montague Island and the Colorado River below Porto La Bomba (Oberholser, 1919c, p. 347, and Bancroft, 1927a, p. 56). Winters in the same area (Price, 1899, p. 92, under the name *Ammodramus rostratus guttatus*, and Stone and Rhoads, 1905, p. 684), but also visits at that

season apparently the entire coast line of Lower California, Pacific side as well as the Gulf side. How the birds get to the opposite side of the base of the peninsula from their breeding ground, whether the long way around via Cape San Lucas, or directly across over the intervening highlands, is as yet unknown. Some stations of winter occurrence, according to Oberholser (1919c, pp. 346-349) in his revision of this group of marsh sparrows, are as follows, beginning on the

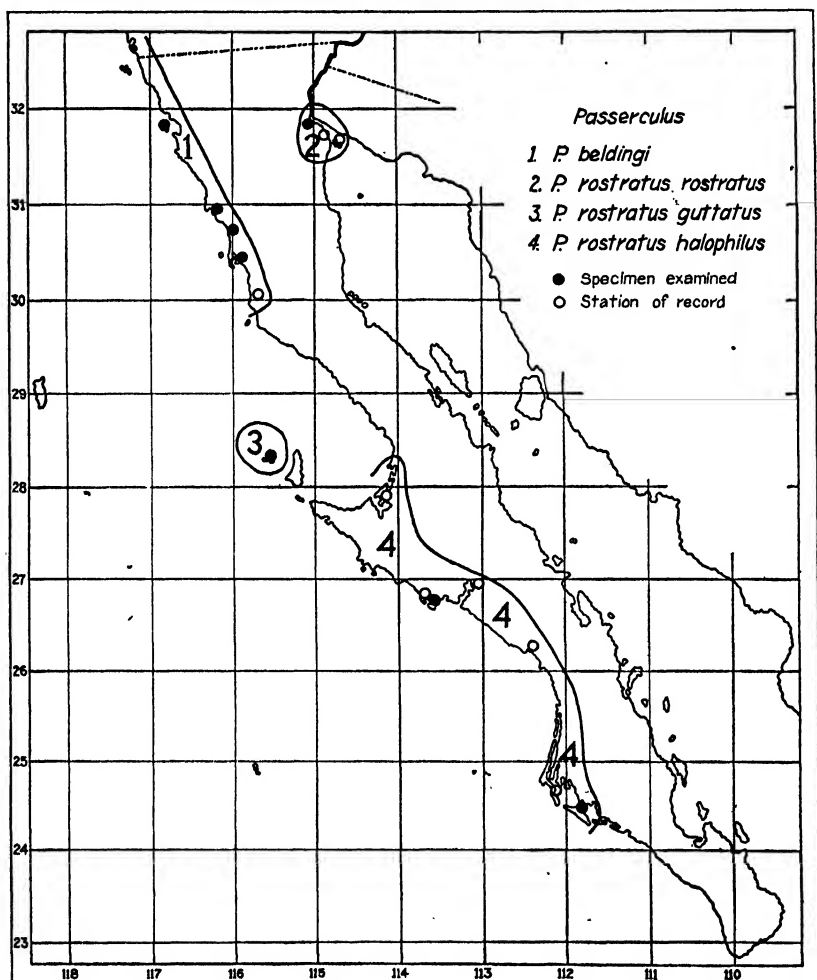


Fig. 10. Breeding ranges of Marsh Sparrows, genus *Passerculus*, in Lower California.

Gulf side: San Lucas [near lat. 27° 15'], October 26; Carmen Island, March; La Paz, December to February; San José del Cabo, August 31 to January; Cape San Lucas, September 8 to April 22 [specimens taken by Xantus in 1859]; Magdalena Island, November; Mangrove Island [Magdalena Bay], March 20; Abreojos Point, March 16; San Cristóbal Bay, March 16; Santo Domingo [near lat. 28° 15'], September 26; Santa Rosalía Bay, August 16; Playa María Bay,

August 25; San Quintín, August 31. Specimens of definitely this subspecies in the Museum of Vertebrate Zoology come from additional points: Colorado River, 23 miles south of El Major, at head of tidewater, February 20; San Ramón, December; Colnett, September 25; Todos Santos Islands, January; five miles south of Monument 258, December and January. Apparently the first published record based on the specimens taken by Xantus at Cape San Lucas was that by Baird (in Cooper, 1870, p. 184). The first person to find this sparrow on its breeding grounds, at "mouth of Colorado River," was apparently Edward Palmer (Baird, Brewer and Ridgway, 1874, I, p. 542). Some important references not given above are: Brewster, 1902, p. 138, under the name *Ammodramus rostratus* (Cape district); Grinnell, 1905, p. 16, and Anthony, 1906b, p. 149 (speculative as to breeding place); Anthony, 1925, p. 299 (Cedros Island, August 9, and San Martín Island, August 14); Huey, 1927d, p. 32 (San Felipe, on the Gulf, March 31 and April 1). There are still other locality records not mentioned above; but, in lack of specimens, whether they apply to the present subspecies is in doubt. This sparrow was originally described from a winter-taken bird from San Diego, upper California.

***Passerculus rostratus guttatus* Lawrence**

San Benito Marsh Sparrow

Breeds abundantly on the San Benito Islands—and nowhere else so far as information now available shows. But the population scatters in winter up and down the west side of the peninsula practically its whole length, reaching even around to certain islands in the Gulf. First recorded, and originally described (Lawrence, 1867, p. 473, under the name *Passerculus guttatus*), from a bird [no. 17291 in U. S. Nat. Mus.] taken by John Xantus, December 5, 1859, at San José del Cabo. But the breeding ground of the subspecies represented by this type was not correctly determined until the thoroughgoing revision of the group by Oberholser (1919c). According to this authority, the name *Passerculus sanctorum* Ridgway [quoting from Coues MS] (in Belding, 1883b, p. 538), type no. 70636 in U. S. Nat. Mus., from "San Benito Island," is a pure synonym of *P. r. guttatus*. First recorded from the San Benitos by Streets (1877, p. 10); other accounts from those islands are: McGregor, 1897, p. 42, and 1898c, p. 264, under *Ammodramus sanctorum*; Kaeding, 1905, p. 135, under *Passerculus rostratus*, and p. 136, under *Passerculus rostratus sanctorum*; Anthony, 1906b, p. 150; Thayer and Bangs, 1907b, pp. 79, 81; Anthony, 1925, p. 299. Wintering stations for this subspecies as verified by Oberholser (1919c, p. 352) are: Abreojos Point, March 16; San José Island, February 12; Carmen Island, March 6. In the Museum of Vertebrate Zoology are specimens from: San Quintín, December; San Ramón, December; Todos Santos, latitude 23° 27', September 14 and 22; San Benito Islands, July, September and March. Lamb (1927a, p. 70) records this form from Natividad Island, in midwinter; and Thayer and Bangs (*loc. cit.*), a straggler from Cedros Island, April 21. Other published records are of doubtful application, not only because of the confusion in the use of names, but because of the difficulty in identifying specimens in the various plumages. Thus Brewster's account (1902, p. 139, under *Ammodramus rostratus guttatus*) is a composite, as shown on comparison with Oberholser's findings.

***Passerculus rostratus halophilus* (McGregor)**

Laguna Marsh Sparrow

Common resident locally on the western coast of the mainland of the peninsula between latitudes 24° and 28°; scatters somewhat in winter, reaching the Cape

district proper. First recorded, and the form newly described, by McGregor (1898d, p. 265, under the name *Ammodramus halophilus*), with type [now no. 38303 in J. Dwight coll.] a breeding bird taken by himself at Abreojos Point, near latitude 26° 45', April 19, 1897. Recorded also in the breeding season from San Juanico Bay [lat. 26°] (Kaeding, 1905, p. 135, under *Passerculus rostratus*), from Magdalena Bay (McLellan, 1926, p. 308, under *Passerculus rostratus guttatus*), and from Scammon Lagoon and San Ignacio Lagoon (Bancroft, 1927a, pp. 55-57, and 1927b, p. 195, using the name *Passerculus beldingi halophilus*). Oberholser (1919c, pp. 353-354) in his revision of the group records winter-taken specimens of *halophilus* as follows: San José del Cabo, in January; Mangrove Island and elsewhere in Magdalena Bay [where likely breeding also], in March; Santa María "Island" [= Bay, lat. 24° 45'], in March. In the Museum of Vertebrate Zoology are specimens taken at Todos Santos, latitude 23° 27', September 8 to 21 (see Lamb, 1927b, p. 157). Again, as regards published ascriptions, there is such manifest confusion that one is not warranted in crediting "records" without examining actual specimens. For example, Nelson (1921, p. 130) lists *Passerculus rostratus halophilus* as characterizing the Upper Sonoran Zone, "San Diegan District"!

***Ammodramus savannarum bimaculatus* Swainson**

Western Grasshopper Sparrow

Known only as an apparently rather rare winter visitant to the Cape district. First reported by Belding (1883b, p. 540, under the name *Coturniculus passerinus per pallidus*) as "seen at several localities" in the Cape region. Brewster (1902, p. 142) records that Frazar found this sparrow at San José del Cabo, October 21 and 27, and at Triunfo, December 5 and 15. Four specimens were obtained by him, and these I have examined, finding them identical with birds from upper California.

***Chondestes grammacus strigatus* Swainson**

Western Lark Sparrow

Common winter visitant south throughout the entire length of the peninsula. First reported by Baird (1859, p. 304, under the name *Chondestes grammaca*) as obtained by Xantus at Cape San Lucas. Then recorded by Belding (1883b, p. 540) as "common" in the Cape region, where also subsequently found by Frazar (Brewster, 1902, p. 142); the latter specifies localities: San José del Cabo, Triunfo, and Pierce's Ranch—earliest in the fall, October 8. Kaeding (1905, p. 136) records it from San José del Cabo as late in the spring as April 23. Townsend (1890, p. 137, and 1923, p. 19) reports the species from Cape San Lucas, April 7 and March 22-24. Farther north, Bryant (1889b, p. 300) reports finding it "generally distributed over the peninsula in winter and spring," and that Anthony had seen it at San Quintín "in spring." Price (1899, p. 92) found it in December along the lower Colorado River. In the Museum of Vertebrate Zoology are specimens of following sources: Santo Domingo, latitude 30° 45', December 14; San José, latitude 31°, October 18; El Valle de la Trinidad, November 18; Las Cruces, east of Ensenada, January 5; Tecate, January 22. In the Carnegie Museum are specimens, taken by Anthony, from Valle de las Palmas, April 6, and Carriso Valley, March 30 and April 20.

***Zonotrichia leucophrys leucophrys* (J. R. Forster)**

Hudsonian White-crowned Sparrow

Common winter visitant locally in the Cape district, and common and widespread as a spring and fall transient there and elsewhere the entire length of

the territory. First reported by Baird (1859, p. 304) as having been taken by Xantus at Cape San Lucas. Belding (1883a, p. 531, and 1883b, p. 540) found this sparrow on Cedros Island in late April, and at La Paz up to May 1. Other records are: San José del Cabo, earliest, October 11 (Brewster, 1902, p. 143); La Paz, January, and San Nicolás, October (Sharpe, 1888, p. 606); San José del Cabo, April 23 (Kaeding, 1905, p. 136); Santa Margarita Island (Bryant, 1889b, p. 300); Rosarito and San Jabier, March (Thayer and Bangs, 1907c, p. 140); San Bartolomé Bay, March (Townsend, 1923, p. 19); El Rosario, May 23, and Santo Domingo, February 21 (Huey, 1926, p. 357); La Grulla, Sierra San Pedro Mártir, September 28 (Huey, 1927a, p. 153). In the Carnegie Museum is a specimen taken by Anthony from San Fernando, April 29. In the Museum of Vertebrate Zoology are skins as follows: Aguaje del Sauce, April 30; La Grulla, 7200 feet altitude on Sierra San Pedro Mártir, October 10 and 15; San Ignacio, April 10.

***Zonotrichia leucophrys gambelli* (Nuttall)**

Gambel White-crowned Sparrow

Abundant winter visitant throughout the northern third of the territory; occurs also thence south to the Cape district, but in lesser numbers. Recorded first by Streets (1877, p. 11, under the name *Zonotrichia leucophrys intermedia*) from Los Coronados Islands; but specimens had been taken previously, in 1859, at San Nicolás and San José del Cabo by Xantus (Ridgway, in Belding, 1883b, p. 533, under *Zonotrichia gambelli intermedia*). Subsequent records are too numerous to cite at length; here are some selections: Cedros Island, January 11, Santa Margarita Island, and Ensenada (Bryant, 1886, p. 64, and 1889b, p. 300, under the names *Zonotrichia gambelli* and *Zonotrichia intermedia*); Triunfo, April 18, and San José del Cabo, October 13 and in November (Brewster, 1902, p. 144); Todos Santos and San Martín islands, March (Kaeding, 1905, p. 136); Colnett, April 8 (Willett, 1913, p. 23); San Quintín, April (Howell, 1911, p. 152); San Fernando, up to April 29 (Anthony, 1895d, p. 141); San Felipe, April 12 (Huey, 1927d, p. 32); lower Colorado River in December, "abundant" (Price, 1899, p. 92). Specimens in the Museum of Vertebrate Zoology come from many localities, mostly north of 30°, of dates throughout the winter. Some more notable occurrences are: San Ignacio, latitude 27° 20', April 14; San Felipe, on the Gulf side, March 25; La Grulla, 7200 feet, on the Sierra San Pedro Mártir, October 7; El Rayo, 4700 feet, Sierra Juárez, October 18; Las Palmas Cañon, west side Laguna Salada, November 8; Colorado River, twenty miles south of Pilot Knob, October 19; ten miles west of Pilot Knob and one mile south of United States boundary, March 13.

***Zonotrichia albicollis* (Gmelin)**

White-throated Sparrow

Rare winter visitant. A single record: Specimen taken "near the corral on the shore of Guadalupe Island," October 10, 1913 (Kimball, 1922, p. 96). This specimen, which I have examined, is no. 558 in the H. H. Kimball collection, now housed in the Southwest Museum, Los Angeles.

***Zonotrichia coronata* (Pallas)**

Golden-crowned Sparrow

Winter visitant; fairly common north of latitude 30°, rare to the southward. Reported first from Cape San Lucas, doubtless as obtained by Xantus in 1859 (Baird, in Cooper, 1870, p. 197). Recorded next by Bryant (1887a, p. 298) from Guadalupe Island, where he obtained three specimens, February 16 and March

4, 1886. Townsend (1923, p. 19) records specimens from Cedros Island, March 12, and Cape San Lucas, March 24. Anthony (1893, p. 241) found the species "quite common" in April about the west base of the Sierra San Pedro Mártir. Huey (1927a, p. 154) records specimens from Laguna Hanson, October 13, and Rancho San Pablo, ten miles southeast of Álamo, December. There are specimens in the Museum of Vertebrate Zoology with data as follows: Las Cruces, east of Ensenada, December 29 and 31; Valladares, 2700 feet, April 17; Concepción, 6000 feet, November 14; five miles south of Monument 258, at the United States boundary, January 1 and 2.

***Spizella passerina stridula* Grinnell**

Pacific Chipping Sparrow

Winter visitant locally south the whole length of the territory. Most numerous north of latitude 30°, and there is some evidence that a few individuals remain through the summer and breed on the Sierra San Pedro Mártir. First recorded by Belding (1883c, p. 347, under the name *Spizella socialis arizonae*) as "rather rare" in the Victoria Mountains. Another ascription to the Cape district is that by Brewster (1902, p. 144), who records a specimen taken April 30 on the Sierra de la Laguna [a portion of the Victoria Mountains]; I have examined this specimen (no. 15888 in the Brewster coll., Mus. Comp. Zool.) and find that it shows certain individual features which account fortuitously for its presence so late in the spring. Furthermore, this bird is of the Pacific Coast race, *stridula*. Lamb (1927b, p. 157) records two specimens of Chipping Sparrow from El Valle, 1500 feet altitude, also in the Cape district, January 16. Records toward the north are as follows: Guadalupe Island, one specimen, January 6, 1886 (Bryant, 1887a, p. 299); Santana [lat. 28° 40'], March 20 and 24 (Thayer and Bangs, 1907c, p. 139); Cedros Island, "fairly common" April 15 to 21 (Willett, 1913, p. 23, under *Spizella passerina arizonae*); west base of Sierra San Pedro Mártir, also "at 7000 feet elevation May 10" (Anthony, 1893, p. 241); Los Coronados Islands, April 8 (Osburn, 1909, p. 137); San Felipe, on the Gulf, March 24 and April 12 (Huey, 1927d, p. 32); Hardy River, in Colorado delta, February (Stone and Rhoads, 1905, p. 684). Specimens in the Museum of Vertebrate Zoology are representative of the following localities: San Felipe, on the Gulf side, April 14; El Mayor, Colorado delta, April 19; Colorado River, twenty and forty miles south of Pilot Knob, October 21, March 4 and 6, and February 28; Nachoguero Valley, 3400 feet, November 15 and 16; Laguna Hanson, on the Sierra Juárez, October 7 to 26; La Grulla, 7200 feet on the Sierra San Pedro Mártir, October 15; San José, October 18 to November 10; Valladares, April 23; San Telmo, April 3; Santo Domingo, December. In the Carnegie Museum is a bird taken by Anthony on the San Pedro Mártirs, of date "5-21-1893"; this comes nearer establishing that the species summers on those mountains than any other evidence yet forthcoming.

***Spizella pallida* (Swainson)**

Clay-colored Sparrow

Common winter visitant in the Cape district proper. Curiously, there is not a single instance of occurrence in the northern half of the territory. Reported first by Baird, Brewer and Ridgway (1874, II, p. 12) from Cape San Lucas, doubtless on the basis of one or more Xantus-taken specimens. Then Belding (1883b, p. 540) recorded his finding this species "common" at and south of La Paz and at San José del Cabo. Other Cape district records are: San José del Cabo, April 23 (Kaeding, 1905, p. 136) [five specimens taken, in Carnegie Mus.,

examined by me]; San José del Cabo, as early as October 14, Triunfo, and Santiago (Brewster, 1902, p. 145); Cape San Lucas, March 24 (Townsend, 1923, p. 19). Bryant (1889b, p. 301) found it "common on Santa Margarita Island [in March] and northward on the peninsula"; specific localities in the latter regard not given. In the Museum of Vertebrate Zoology are specimens of this sparrow taken by C. C. Lamb at San Ignacio, April 11, 22 and 28, 1927; this station, latitude 27° 20', is the northernmost as yet definitely known for both Lower and upper California.

***Spizella breweri* Cassin**

Brewer Sparrow

More or less common, in places abundant, as a winter visitant south throughout the entire length of the territory. Reported first by Streets (1877, p. 10), a specimen from Ángel [de la Guardia] Island. Belding (1883b, p. 540) considered this sparrow "abundant" in winter in the Cape region; but Brewster (1902, p. 145) reports that Frazar did not find it at all common—at La Paz, Triunfo, and San José del Cabo, as also on Carmen Island. Other records, from south to north, are: San José del Cabo, April 23 (Kaeeding, 1905, p. 136); Cape San Lucas, March 24, Espiritu Santo Island, April 19, Carmen Island, April 3 (Townsend, 1923, p. 19); San Julio (near Comondú), March (Bryant, 1889b, p. 301); Cedros Island, March 30 (Thayer and Bangs, 1907b, p. 79); Santana, San Jabier and Rosarito, February 26 to April 1 (Thayer and Bangs, 1907c, p. 140); San Felipe (Huey, 1927d, p. 32); Colorado delta region, February to April 19 (Stone and Rhoads, 1905, p. 684, and Murphy, 1917, p. 95). In the Carnegie Museum are two Anthony-taken specimens: San Quintín, March 9, and Carriso Valley, April 21. In the Museum of Vertebrate Zoology are specimens representing the following localities at the north: Santo Domingo, December 14; San José, latitude 31°, October 22; El Valle de la Trinidad, November 16; San Felipe, on the Gulf, March 25 to April 12; Colorado River, twenty miles south of Pilot Knob, October 13; Las Palmas Cañon, west side Laguna Salada, October 31.

***Spizella atrogularis cana* Coues**

California Black-chinned Sparrow

Fairly common in summer within the Upper Sonoran life-zone north from about latitude 30°; winter visitant or transient to the southward clear to the Cape district. First recorded, from Xantus-taken specimens, by Coues (1866, p. 88), who also first publishes the name *Spizella cana* [from Baird MS] with type [no. 23867 in U. S. Nat. Mus.] from Sierra "San Gertrude," near Cape San Lucas, January, 1861 (see Grinnell and Swarth, 1926e, pp. 475-478). Other Cape district stations are: Victoria Mountains, and Pescadero [lat. 23° 22', Pacific side] (Belding, 1883c, p. 348, under the name *Spizella atrigularis*); La Paz in February, and Triunfo in April [last on the 23rd] (Brewster, 1902, p. 146); El Valle, in January (Grinnell and Swarth, 1926e, p. 477, and Lamb, 1927b, p. 157). To the northward: Santana [lat. 28° 40'], March 19 (Thayer and Bangs, 1907c, p. 139); San Andrés Ranch, near Playa María Bay [about September 20] (Nelson, 1921, p. 29); San Quintín, late in April (Howell, 1911, p. 152); between San Rafael [east of Ensenada] and Sierra San Pedro Mártir in May, according to Belding, and Valladares, nesting, according to Anthony (Bryant, 1889b, p. 301). Anthony (1893, p. 241) thought that he "heard" this species high on the Sierra San Pedro Mártir in May. There are Anthony-taken skins in the Carnegie Museum from Valladares, April 2, and San Telmo, April 30.

In the Museum of Vertebrate Zoology are specimens from Aguaje del Sauce, April 30, and San José, May 5. Huey (1926, p. 357) records the species from Socorro [near lat. 31°], near Nejí [north of lat. 32°], and El Rayo [in Sierra Juárez], in June.

***Junco hyemalis hyemalis* (Linnaeus)**

Eastern Slate-colored Junco

Rare winter visitant at the north. Stone and Rhoads (1905, p. 684) record a "typical male" taken February 24, 1905, at [the east base of] the Cocopah Major Mountains, Colorado Desert; through the courtesy of Dr. Stone, I have examined this specimen [now no. 48366, Acad. Nat. Sci. Phila.], and I have confirmed its identification as *hyemalis*. In the Museum of Vertebrate Zoology is an adult male (no. 50054) taken by C. C. Lamb, October 26, 1926, at Laguna Hanson, 5200 feet altitude, Sierra Juárez.

***Junco oreganus shufeldti* Coale**

Shufeldt Oregon Junco

Sparing winter visitant into the northwestern section of the territory. Anthony (1895e, p. 183, under the name *Junco hyemalis shufeldti*) records a specimen taken by him in Carriso Valley, six miles east of Tia Juana, March 29, 1894. This specimen [now no. 14846, Carnegie Mus.] I have examined; while not typical, I consider it best referred to *shufeldti*. Ridgway (1901a, p. 287) cites the Anthony reference, but gives the locality, erroneously, as "near San Fernando." The A. O. U. Check-list (ed. 3, 1910, p. 266) cites what is clearly the same occurrence under the name *Junco hyemalis connectens*. In the Museum of Vertebrate Zoology are specimens I refer to the subspecies *shufeldti*, as follows: Laguna Hanson, Sierra Juárez, six specimens, October 6 to 26; Las Cruces, twenty miles east of Ensenada, two, December 29 and January 3; Tecate, one, January 21; south end of Valle de las Palmas, January 12; Alamo River, twenty miles southwest of Pilot Knob, January 23.

***Junco oreganus thurberi* Anthony**

Sierra Nevada Oregon Junco

Common winter visitant south into the northern section of the territory, chiefly over the Pacific drainage, and not on the mainland beyond about latitude 30°. First recorded, with little doubt the present subspecies, by Bryant (1887a, p. 299, under the name *Junco hyemalis oregonus*): a specimen obtained on Guadalupe Island, February 16, 1886 [presumably destroyed in the San Francisco fire of 1906]. Mainland records are as follows: West base of Sierra San Pedro Mártir in winter (Anthony, 1889a, p. 77); Burro Cañon, north of Ensenada, April 23 (Anthony, 1893, p. 241, under *Junco hyemalis thurberi*); El Rosario [lat. 30°], January (Anthony, 1895e, p. 183); Las Animas Cañon, ten miles south of Ensenada, February 19 (Huey, 1926, p. 357); [east base of] Cocopah Mountains, Colorado Desert, February (Stone and Rhoads, 1905, p. 684). In the Anthony collection in the Carnegie Museum are specimens as follows: Valle de las Palmas, April 5; Burro Cañon, April 9; Valladares, December 8; El Rosario, January 7, 1894. In the Museum of Vertebrate Zoology is a large series representing the following localities: La Grulla, 7200 feet, Sierra San Pedro Mártir, October 9 and 12; Concepción, 6000 feet, November 16 to 21; San José, 2500 feet, October 18 to November 10; El Valle de la Trinidad, 2500 feet, November 22 to December 1; Laguna Hanson, 5200 feet, Sierra Juárez, October 6 to 26; El Rayo,

4700 feet, October 18; Los Pozos, 4200 feet, October 29 to November 2; Nachoguero Valley, 3400 feet, November 15 to 29; Las Cruces, 20 miles east of Ensenada, December 31 to January 8; Álamo River, twenty miles southwest of Pilot Knob, January 21, 1928 (one specimen).

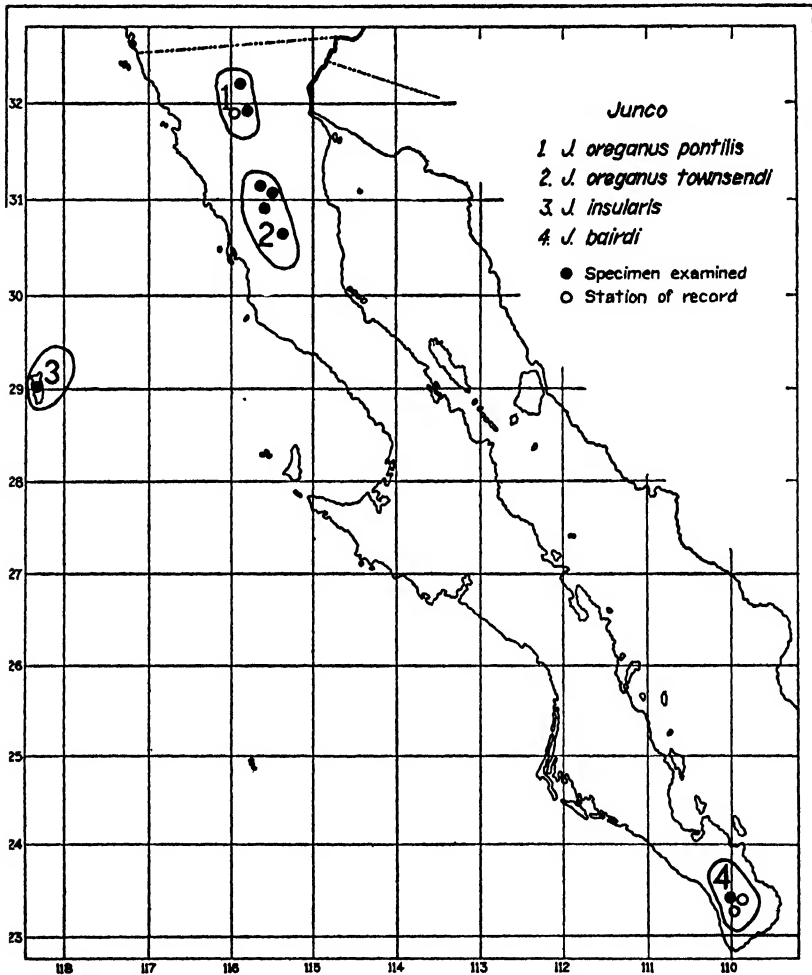


Fig. 11. Breeding ranges of Juncos, genus *Junco*, in Lower California.

***Junco oreganus pontilis* Oberholser**

Hanson Laguna Oregon Junco

Resident on the Sierra Juárez; life-zone, Transition. Apparently not very common. First recorded, undoubtedly this subspecies, by Bryant (1889b, p. 301, under the name *Junco hyemalis oregonus*) as having been found by Belding in May, 1884, "in the pine regions about Hansen's." The subspecies was newly described by Oberholser (1919d, p. 119), with type [no. 196964 in U. S. Nat. Mus.] from El Rayo, taken by E. W. Nelson and E. A. Goldman, June 4, 1905;

specimen listed also from Hanson Laguna, June 5. In the Museum of Vertebrate Zoology are specimens from Laguna Hanson, 5200 feet, October 9 to 22, and Los Pozos, 4200 feet, October 31.

***Junco oreganus townsendi* Anthony**

Townsend Oregon Junco

Common resident on the Sierra San Pedro Mártir. Life-zone, Transition and Canadian. A slight scattering in the fall carries a few individuals to somewhat lower levels close by. First recorded, and the form newly described, by A. W. Anthony (1889a, p. 76, under the name *Junco townsendi*) with type [now no. 14910 in Carnegie Mus.] from "San Pedro Mountain," where taken by him, April 28, 1889; a specimen is also recorded from Valladares [2700 feet altitude], December 8. Other important references are: Anthony, 1890, p. 5 (nesting), 1893, p. 241 (nesting at La Grulla [7200 feet]), and 1895e, p. 183 (using the name *Junco hyemalis townsendi*). Dwight (1918, pp. 296, 297, proposing the name-combination *Junco mearnsi townsendi*, emended [1919, p. 287] to *Junco insularis townsendi*) gives a theory of phylogeny, which, however, Oberholser (1919d, p. 120) shows to be inconsistent with the facts. Specimens of this junco in the Museum of Vertebrate Zoology come from: Vallecitos, 7500 to 8500 feet, June; Santa Rosa flats, May 31; La Grulla, 7000 to 7400 feet, May and October; Concepción, 6000 feet, November 16.

***Junco insularis* Ridgway**

Guadalupe Junco

Resident and formerly abundant on Guadalupe Island, but now becoming rare. First recorded, and the species described, by Ridgway (1876b, p. 188) from specimens obtained by Edward Palmer; the type is no. 70015 in U. S. Nat. Mus., and was taken February 12, 1875 (*vide* C. W. Richmond). The next account, and best life-history, is given by Bryant (1887a, p. 300). Other references, omitting purely systematic ones and repetitions, are: Ridgway, 1877, pp. 60-66 (phylogeny); Townsend, 1890, p. 138; Lucas, 1891, p. 220 (osteology); Gaylord, 1897a, p. 42, and 1897b, p. 98 (behavior); Thoburn, 1899, p. 278; Kaeding, 1905, p. 136; Thayer and Bangs, 1908, p. 106; Townsend, 1923, p. 19; Anthony, 1925, p. 300 ("becoming rare" in 1922); McLellan, 1926, p. 308 ("scarce" in 1925). Dwight (1918, pp. 296, 297, under the name *Junco mearnsi insularis*, and 1919b, p. 287, under *Junco insularis insularis*) sets forth a theory of phylogeny which, however, is very unlikely to prove tenable. There are four skins of this junco in the Museum of Vertebrate Zoology, taken by or for A. W. Anthony, and received through the Carnegie Museum, of following dates: May 26, 1892; September 20 and 21, 1896; March 24, 1897.

***Junco bairdi* Ridgway**

Baird Junco

Common resident in the Victoria Mountains, Cape district, where restricted to the higher elevations; life-zone Upper Sonoran. First reported, and the species newly described, by Ridgway (1883b, p. 155) from specimens [type is no. 89810 in U. S. Nat. Mus.] taken by Lyman Belding at La Laguna, February 2, 1883. Belding subsequently (1883c, pp. 346, 348, and 1900, p. 3) states that he found it to be common in the Victoria Mountains [including the Sierra de la Laguna] above 3000 feet altitude. These facts are corroborated by Brewster (1902,

p. 147) and Thayer (1909a, p. 11); the former records a straggler from Triunfo, April 13. Bryant (1891, p. 198) records one bird from San Francisquito, which, however, is quite within the Victoria mountain mass. Two skins from the Sierra de la Laguna are contained in the Museum of Vertebrate Zoology, taken by Loye Miller and J. F. Abbott for W. W. Price, June 16 and July 8, 1896.

***Amphispiza bilineata deserticola* Ridgway**

Desert Black-throated Sparrow

Common resident in the northern half of the territory, north from about latitude 27° to about 32° on the Pacific drainage interiorly, and to the United States boundary on the Gulf drainage. Life-zone, Lower Sonoran. First reported, this subspecies most likely, by Belding (1883a, pp. 529, 531, under the name *Amphispiza bilineata*) from Santa Rosalia Bay and Cedros Island. Other important ascriptions are: Cedros Island (Bryant, 1886, p. 64, Townsend, 1890, p. 138, Thayer and Bangs, 1907b, p. 79, and Willett, 1913, p. 23); Rosarito, San Jabier, and Santana (Thayer and Bangs, 1907c, p. 139); Natividad Island (Kaeding, 1905, p. 136, and Lamb, 1927a, p. 70); San Bartolomé Bay (McLellan, 1926, p. 308); San Fernando (Anthony, 1895d, p. 141); El Rosario (Huey, 1926, p. 357); San Quintín (Anthony, 1925, p. 300); Sangre de Cristo, west base Sierra Juárez, breeding (Huey, 1928a, p. 158); San Rafael Valley [25 miles east of Ensenada] (Bryant, 1889b, p. 302); San Felipe (Huey, 1927d, p. 32); Cocopah Mountains, Colorado Desert (Stone and Rhoads, 1905, p. 684); Ángel de la Guardia Island, in the Gulf (Mailliard, 1923, pp. 451, 455, part). In the Museum of Vertebrate Zoology are included specimens with the following data: El Valle de la Trinidad, 2500 feet, November 15 to December 12; El Cajón Cañon, 2300 to 3200 feet, east base Sierra San Pedro Mártir, May 19 to June 3; San Fernando, May 20 and June 3; Cedros Island, July 22 to 25; 33 miles west of Calmallí, May 28 and 29; vicinity of San Ignacio, May 1, 9 and 14; San Lucas, latitude 27° 14', on the Gulf, May 11. Specimens from the last four localities appear to be varying intermediate toward the race *bangsi*.

***Amphispiza bilineata bangsi* Grinnell**

San Lucas Black-throated Sparrow

Common resident locally in the Cape district proper and thence north to about latitude 26°. Life-zone, Lower Sonoran. Reported first by Belding (1883b, p. 540, under the name *Amphispiza bilineata*) who found it "common" in the Cape region. Bryant (1889b, p. 302) found the species nesting on Santa Margarita and Magdalena islands. Other records of note are: La Paz (Sharpe, 1888, p. 629); Triunfo, San José del Cabo, La Paz, and Carmen Island (Brewster, 1902, p. 148, under *Amphispiza bilineata deserticola*); San José del Cabo (Kaeding, 1905, p. 136); Cerralvo Island (Nelson, 1921, p. 91); Carmen, Santa Catalina, Santa Cruz, and Espíritu Santo islands (Townsend, 1890, p. 137, and 1923, p. 20); Coronados, San Josef and Cerralvo islands (Mailliard, 1923, pp. 453, 455, part); Magdalena Bay (Anthony, 1925, p. 300, and McLellan, 1926, p. 308). I have examined a specimen, in the Thayer collection, taken on San José Island, June 27, 1908. This subspecies was newly named by Grinnell (1927a, p. 71) with type [no. 15968 in Brewster coll. in Mus. Comp. Zool.] from La Paz, taken by M. A. Frazer, January 11, 1888. Intergradation between the races *bangsi* and *deserticola* probably takes place through the middle section of the peninsula, along about latitude 27°.

***Amphispiza belli belli* (Cassin)**

California Bell Sparrow

Common resident locally in the northwestern section of the territory, altogether on the Pacific drainage and north from about latitude $29^{\circ} 30'$. Life-zone chiefly Upper Sonoran, though partly Lower Sonoran toward the south; association, an open sparse type of chaparral. First recorded by Bryant (1889*b*, p. 302) as obtained by himself near San Quintín and as having been found by Anthony immediately to the westward of the Sierra San Pedro Mártir, "from sea-level up to 1,500 feet elevation." Other records of occurrence are: "latitude of San Fernando," within "four or five miles from the beach" (Anthony, 1895*d*, p. 141); San Martín Island, common and breeding (Kaeding, 1905, p. 136, Willett, 1913, p. 23, Anthony, 1925, p. 300, and McLellan, 1926, p. 309); San Quintín (Howell, 1911, p. 153, Anthony, *loc. cit.*, and McLellan, *loc. cit.*); Santa Catarina Landing [the southernmost station for this subspecies] (Huey, 1926, p. 357). In the large series in the Museum of Vertebrate Zoology, localities are represented as follows: San José, 2500 feet; Valladares, 2700 feet; San Telmo; San Ramón; San Martín Island; El Valle de la Trinidad, 2500 feet; Las Cruces, 20 miles east of Ensenada; Descanso Bay [lat. $32^{\circ} 15'$]; Nachoguero Valley, 3400 feet; south end of Valle de las Palmas, 1200 feet; five miles south of Monument 258, at the United States boundary.

***Amphispiza belli cinerea* C. H. Townsend**

Gray Bell Sparrow

Common resident locally in the waist of the peninsula, between about latitudes 26° and 29° . Life-zone, Lower Sonoran, in the Vizcaino Desert district. First recorded, undoubtedly this subspecies, by Belding (1883*a*, p. 530, under the name *Amphispiza belli*) from Santa Rosalía Bay as observed there April 28, 1882. The subspecies was newly named by Townsend (1890, p. 136) with type [no. 117575 in U. S. Nat. Mus.] taken by himself at Ballenas Bay [lat. $26^{\circ} 40'$], in May [3 or 4], 1888. Other stations of recorded occurrence are San Jabier and Rosarito (Thayer and Bangs, 1907*c*, p. 139); Santo Domingo [near lat. $28^{\circ} 15'$] (A. O. U. Check-list, ed. 3, 1910, p. 270, under *Amphispiza nevadensis cinerea*). In the Carnegie Museum, Anthony collection, are specimens from Playa María Bay, which I have examined and found to be quite good *cinerea*, thus marking the northernmost station for this race. Ridgway (1901*a*, p. 268) comments upon specimens from Santa Rosalía Bay, not quite so far north, as being not either *belli* or *cinerea*, but somewhat intermediate in characters. A small series in the Museum of Vertebrate Zoology, taken by C. C. Lamb near the shore of Santa Rosalía Bay, May 29 to 31, 1927, looks to me to be unequivocally *cinerea*.

***Amphispiza belli canescens* Grinnell**

California Sage Sparrow

Presumably winter visitant and of occurrence in some numbers in the extreme northeastern corner of the territory, along the western margin of the Colorado Desert. Six specimens are contained in the Museum of Vertebrate Zoology, obtained by C. C. Lamb and J. E. Green at Las Palmas Cañon, west side of Laguna Salada, October 28 to November 8, 1927.

***Amphispiza belli nevadensis* (Ridgway)**

Nevada Sage Sparrow

Presumably regular winter visitant to the extreme northeastern corner of the territory, along the western side of the Colorado Desert. Three specimens are contained in the Museum of Vertebrate Zoology, obtained by C. C. Lamb and J. E. Green at Las Palmas Cañon, west side of Laguna Salada, October 29 and November 1 and 7, 1927.

***Aimophila ruficeps canescens* Todd**

Ashy Rufous-crowned Sparrow

Resident locally at the extreme north, north of latitude 32° 25', and altogether on the Pacific drainage. Life-zone, Upper Sonoran. This subspecies thus barely enters Lower California, as a constituent of the San Diegan subfauna. Intergradation with the race *lambi* evidently begins almost at the United States boundary. The only Lower California specimens at hand, that I consider to be nearest *canescens*, are from Tecate, taken by C. C. Lamb, January 22 and 23, 1927 (nos. 50142-43, Mus. Vert. Zool.).

***Aimophila ruficeps lambi* Grinnell**

Cape Colnett Rufous-crowned Sparrow

Fairly common resident west of the Colorado desert from about latitude 30° 30' north nearly to the United States boundary. Life-zone, chiefly Upper Sonoran, locally Lower Sonoran also. Association, sparse dry-hillside chaparral. This subspecies, named by Grinnell (1926c, p. 244) with type [no. 46357 in Mus. Vert. Zool.] taken by C. C. Lamb, October 28, 1925, at Colnett, is most typical to the westward from the Sierra San Pedro Mártir. First recorded, undoubtedly this race, in part at least, by Anthony (1893, p. 242, under the name *Peucaea ruficeps*) from "between Tia Juana and the base of" the San Pedro Mártirs. In the Carnegie Museum are Anthony-taken specimens, which I have examined, from Sausal del "Comanche" [=Camacho] and Guadalupe Valley, localities close to latitude 32°; these are intermediate toward the race *canescens* but nearest *lambi*. The species breeds commonly on Todos Santos Islands (Kaeding, 1905, p. 136, and Van Denburgh, 1924, p. 71, under *Aimophila ruficeps*); and it has been reported from San Martín Island (Kaeding, *loc. cit.*), and from Point Banda, below Ensenada (Willett, 1913, p. 23). Todd (1922, p. 127) listed under his name *Aimophila ruficeps canescens*, specimens from some of the localities just mentioned above, and also from Piñón, on the western flank of the Sierra San Pedro Mártir. Specimens in the Museum of Vertebrate Zoology come from the following additional localities: Concepción, 6000 feet; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir; El Valle de la Trinidad, 2500 feet; Valladares, 2700 feet; San José, 2500 feet; San Telmo; Las Cruces, 20 miles east of Ensenada; south end of Valle de las Palmas, 1200 feet [intermediate]; five miles south of Monument 258 [intermediate]. A series from Todos Santos Islands shows slight peculiarities, chiefly as intermediate between *lambi* and *canescens*; but I consider them best referable to *lambi*.

Aimophila ruficeps sororia Ridgway

Laguna Rufous-crowned Sparrow

Common resident locally in the mountains of the Cape district, whence first recorded by Belding (1883c, p. 348, under the name *Peucaea ruficeps boucardi*) as found by him on "grassy hillsides above 2,500 feet altitude." Life-zone,

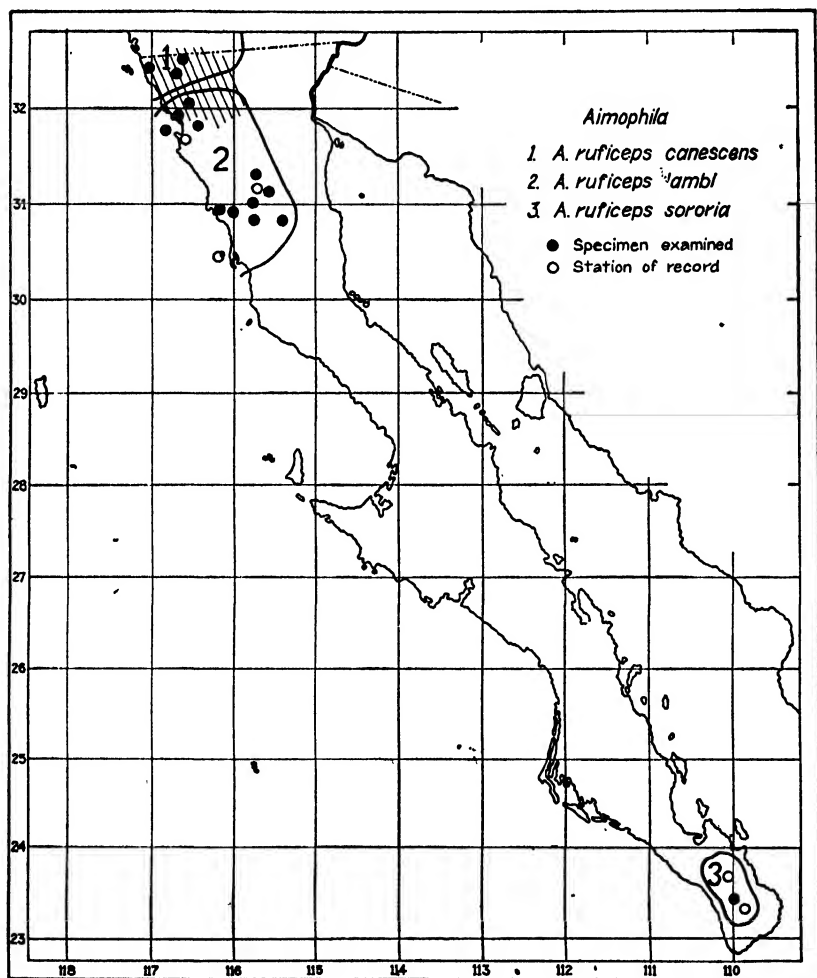


Fig. 12. Distribution of Rufous-crowned Sparrows, genus *Aimophila*, in Lower California. Intergradation between races shown by shading.

Upper Sonoran (Nelson, 1921, p. 130). The present subspecies was newly named by Ridgway (1898, p. 226), with type [no. 90063 in U. S. Nat. Mus.] taken by Lyman Belding in the Victoria Mountains, February 19 [not "9"], 1883 [fide C. W. Richmond]. Thayer (1909b, p. 142) records W. W. Brown's experience with this sparrow at El Sauz a Sierra. Todd's (1922, p. 126) locality "El Lanz"

is, of course, El Sauz. Brewster (1902, p. 149) records this bird as breeding near Triunfo. From north of the Cape district proper, there is record (Bryant, 1889b, p. 302) of one specimen obtained at "Llanos de San Julián April 19, 1889." This locality is not far from Comondú, and the subspecies represented is most likely *scrota*, though the specimen in question is not now extant, for examination. This race has also been included under the name *Peucaea ruficeps* (A. O. U. Comm., 1886, p. 278, and 1895b, p. 240).

***Melospiza melodia cooperi* Ridgway**

San Diego Song Sparrow

Common resident along west-flowing stream courses from San Fernando and El Rosario, lat. 30° (many records), north to the United States boundary. Reaches, south of Cape Colnett, from the coastal marshes east to the upper western flanks of the Sierra San Pedro Mártir, even to as high as 7200 feet altitude, at La Grulla (Mus. Vert. Zool.). Has also been taken at the east base of the San Pedro Mártirs, at mouth of El Cajón Cañon, 3200 feet (Mus. Vert. Zool.). A specimen, not preserved, recorded from Todos Santos Islands near Ensenada (Howell, 1912, p. 190, under the name *Melospiza melodia*, "probably *clementae*") is now thought to have been a straggler of *cooperi*, since repeated visits to those islands have failed to disclose the established presence of song sparrows there. Various combinations of names have been applied to this race in Lower California, as follows: *Melospiza fasciata cooperi*, *Melospiza fasciata samuelis*, *Melospiza fasciata heermanni*, *Melospiza fasciata rivularis*, *Melospiza cinerea cooperi*. First recorded by Belding (1883a, p. 528) from San Quintín Bay. A series of specimens in the L. B. Bishop collection from the southernmost station for this Song Sparrow, namely El Rosario, shows no departure in characters that I can appreciate from topotypes of *cooperi* (vicinity of San Diego, upper California). There is certainly no approach to the very distinct race *rivularis*. Specimens of *cooperi* in the Museum of Vertebrate Zoology come from the following localities, aside from those mentioned above: Concepción, 6000 feet; San José, 2500 feet; Valladares, 2700 feet; San Telmo; San Ramón; El Valle de la Trinidad, 2500 feet; Laguna Hanson, 5200 feet; Tecate; Nachoguero Valley; south end of Valle de las Palmas.

***Melospiza melodia coronatorum* Grinnell and Daggett**

Los Coronados Islands Song Sparrow

Common resident of brushy slopes on all four of Los Coronados Islands (van Rossem, 1924, p. 218). First recorded by McGregor (1899c, p. 88, under the name *Melospiza melodia clementae*); the race named by Grinnell and Daggett (1903, p. 34), from North Island, under the binomial, *Melospiza coronatorum*; type [now no. 36085 in Mus. Vert. Zool.] taken by J. Grinnell, August 7, 1902. Included by Ridgway (1901a, p. 368) under the name *Melospiza cinerea clementae*. Some other references of note are: Wright, 1909, p. 100; Osburn, 1909, p. 137; Howell, 1917, p. 82; Carpenter, 1918, p. 124; Stephens, 1921, p. 97.

***Melospiza melodia saltonis* Grinnell**

Salton Sink Song Sparrow

Common resident in the delta of the Colorado River, whence reported south as far as the mouth of the Hardy (Stone and Rhoads, 1905, p. 685, under the name *Melospiza cinerea fallax*). Reported at the north near the United States boundary west from the Colorado River to the vicinity of Mexicali (Murphy,

1917, p. 96, under *Melospiza melodia fallax*). First recorded by Price (1899, p. 92, under *Melospiza fasciata fallax*). A series of specimens in the Museum of Vertebrate Zoology was obtained on the Colorado River, twenty miles south of Pilot Knob, on the Alamo River, twenty miles southwest of Pilot Knob, and five miles east of Cerro Prieto.

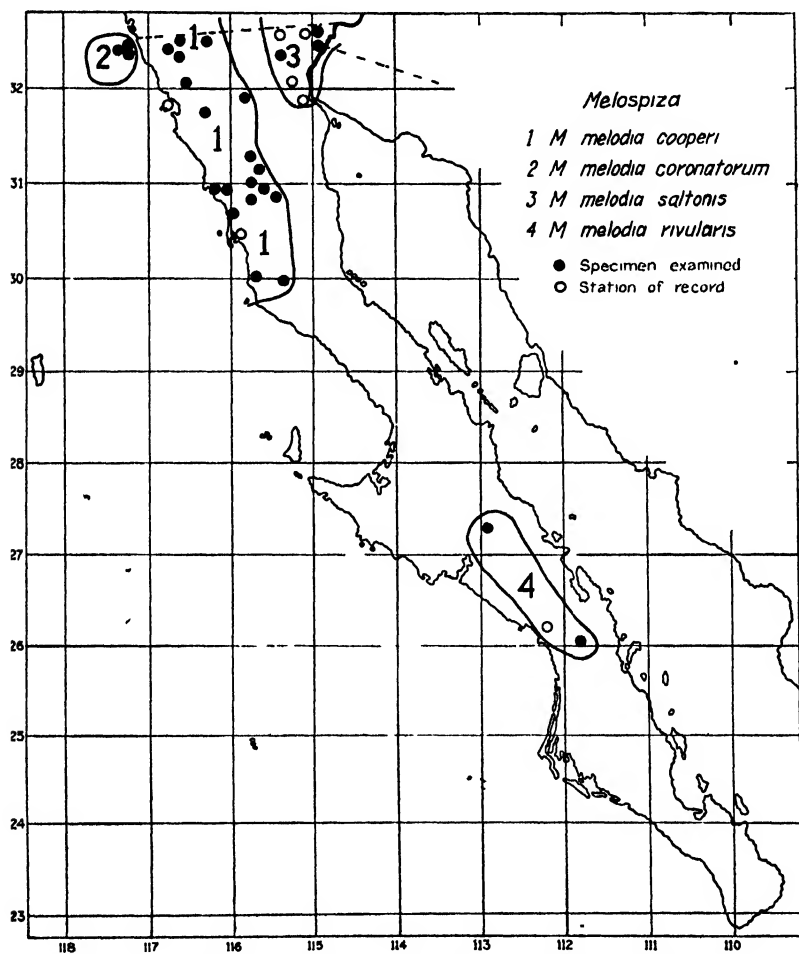


Fig. 13. Distribution of Song Sparrows, part of genus *Melospiza*, in Lower California.

***Melospiza melodia rivularis* W. E. Bryant**

Brown Song Sparrow

Of very limited, though common, occurrence as a resident along west-flowing stream courses from San Ignacio, latitude 27° 15', south to Comondú, latitude 26° (Bryant, 1889b, p. 303). First recorded and newly named, by W. E. Bryant (1888, p. 197, under the name *Melospiza fasciata rivularis*); type from Comondú, taken by himself March 11, 1888, formerly in collection of Calif. Acad. Sci.,

probably destroyed in fire of 1906. Has also been recorded under the combination *Melospiza cinerea rivularis* (Ridgway, 1901a, p. 363). Other references of note are: Bryant, 1889a, p. 22 (nesting at Comondú and San Ignacio); Nelson, 1921, p. 34. The Museum of Vertebrate Zoology contains a series of this Song Sparrow from San Ignacio and Comondú.

***Melospiza lincolni lincolni* (Audubon)**

Northeastern Lincoln Sparrow

Fairly common winter visitant in suitable (riparian or rankly grassy) places south the entire length of the peninsula. First reported by Belding (1883c, pp. 348, 350, under the name *Melospiza lincolni*) from the Victoria Mountains, and from La Paz and to the southward in the lowlands; Belding-taken specimens examined by me are in the United States National Museum as follows: Playitas [somewhere near La Paz, I judge], December 24, 1882; Victoria Mountains, February 22, 1883 [two skins]; San José del Cabo, January 24, 1883. Subsequent ascriptions are as follows: Santiago, November (Brewster, 1902, p. 149); El Oro, February (Lamb, 1927b, p. 157); Guadalupe Island, two specimens, February 5 and 19, 1886 (Bryant, 1887a, p. 302); Comondú and Jesús María [near lat. 27°, in April] (Bryant, 1889b, p. 303); Cedros Island, April 1, 1897 (Kaeding, 1905, p. 136); San Felipe, April 23 (Huey, 1927d, p. 33). In the Anthony collection in the Carnegie Museum are specimens which I have identified as of the present race, as follows: Cedros Island, April 1 [as recorded by Kaeding]; Carriso Valley [near the U. S. boundary], four, March 30 to April 19. In the Museum of Vertebrate Zoology are skins with following data: south end of Valle de las Palmas, 1200 feet, January 13; Valladares, 2700 feet, near latitude 31°, April 15; San Ramón, mouth of Santo Domingo River, March 21 and 23; San Ignacio, April 22.

***Melospiza lincolni gracilis* (Kittlitz)**

Forbush Lincoln Sparrow

Fairly common winter visitant at the north; south, perhaps, rarely, to the southern end of the peninsula. In the Museum of Vertebrate Zoology are skins referable definitely to *gracilis* as follows: La Grulla, 7200 feet, Sierra San Pedro Mártir, October 7, 9 and 15, 1925; El Valle de la Trinidad, 2500 feet, December 14, 1926; Todos Santos Islands, January 12, 1927; five miles south of Monument 258, December 24, 1927, and January 2, 1928; ten miles west of Pilot Knob and one mile south of United States boundary, March 15, 1928. Brewster (1889, p. 90, and 1902, p. 150, under the name *Melospiza lincolni striata*) records as of the present race a specimen in the U. S. National Museum taken by Belding in the Victoria Mountains, February 20 [=22], 1883 (see Belding, 1890, p. 168, under *Melospiza lincolni*). There are two skins of this data in the U. S. National Museum (nos. 90051-52), but neither of them would I call typical *striata* [that is, *gracilis*]; while possibly intermediate, their measurements show them to be nearest the subspecies *lincolni* as now understood.

***Passerella iliaca altivagans* Riley**

Alberta Fox Sparrow

Apparently a fairly common winter visitant at the north, with definitely determined instances of occurrence as follows: Santo Domingo, February 26, 1925 (Huey, 1926, p. 358); La Grulla, 7200 feet, Sierra San Pedro Mártir, October 8, 1925 (Grinnell and Lamb, 1927, p. 125); El Rayo, October 12, 1926, and Laguna Hanson, October 29 and November 16 and 18, 1926, in the Sierra Juárez (Huey, 1927a, p. 154).

***Passerella iliaca schistacea* Baird**

Slate-colored Fox Sparrow

A common winter visitant at the north, with localities of authenticated occurrence as follows: Concepción, 6000 feet, Sierra San Pedro Mártir, November 13, Laguna Hanson, 5200 feet, and El Rayo, 4700 feet, Sierra Juárez, October 18, and Los Pozos, 4200 feet, October 28 to November 2 (Grinnell and Lamb, 1927, p. 125); Laguna Hanson and El Rayo, October 13 to November 11 (Huey, 1927a, p. 154); Nachoguero Valley, November 27 (skins in Mus. Vert. Zool.); Álamo River, twenty miles southwest of Pilot Knob, January 30 (specimen in Mus. Vert. Zool.).

***Passerella iliaca canescens* Swarth**

White Mountains Fox Sparrow

Fairly common winter visitant at the extreme north, with positively determined instances of occurrence as follows: Los Pozos, 4200 feet, north end of Sierra Juárez, October 30 and November 2 (Grinnell and Lamb, 1927, p. 125); Laguna Hanson, Sierra Juárez, October 12 to 30, and Rancho San Pablo, ten miles south-east of Álamo, November 22 (Huey, 1927a, p. 154).

***Passerella iliaca fulva* Swarth**

Warner Mountains Fox Sparrow

Rare winter visitant at the north. One authenticated instance: specimen from Laguna Hanson, Sierra Juárez, October 13, 1926 (Huey, 1927a, p. 154).

***Passerella iliaca monoensis* Grinnell and Storer**

Mono Fox Sparrow

Apparently a common winter visitant in the northern fourth of the territory. Authentic instances of capture are as follows: La Grulla, 7200 feet, Sierra San Pedro Mártir, October 3 and 8, Concepción, 6000 feet, November 12, and Las Cruces, twenty miles east of Ensenada, January 5 (Grinnell and Lamb, 1927, p. 125); Laguna Hanson and El Rayo, Sierra Juárez, October 11 to November 18, and Rancho San Pablo, ten miles southeast of Álamo (Huey, 1927a, p. 154).

***Passerella iliaca mariposae* Swarth**

Yosemite Fox Sparrow

A fairly common winter visitant at the north. Definite instances of occurrence, as follows: La Grulla, 7200 feet, Sierra San Pedro Mártir, October 4 and 9; El Rayo, 4700 feet, Sierra Juárez, October 18; Los Pozos, 4200 feet, October 28; Las Cruces, twenty miles east of Ensenada, January 8 (Grinnell and Lamb, 1927, p. 125).

***Passerella iliaca megarhynchus* Baird**

Thick-billed Fox Sparrow

Winter visitant at the north, evidently in but rather small numbers, with positively determined occurrences as follows: La Grulla, 7200 feet, Sierra San Pedro Mártir, one specimen, October 12, 1925 (Grinnell and Lamb, 1927, p. 125); Laguna Hanson, Sierra Juárez, two, October 13 and November 14, 1926 (Huey, 1927a, p. 154). Anthony (1893, p. 242) was the first to record Fox Sparrows from the San Pedro Mártirs and he did so under the name *Passerella iliaca megarhyncha* [sic]. He says "a few were seen in October on San Pedro and

on one or two subsequent occasions at Valladares." Whether or not he obtained specimens is unknown to me. I was unable, however, to find any at all from Lower California in the Anthony collection in the Carnegie Museum.

Passerella iliaca sinuosa Grinnell

Valdez Fox Sparrow

Fairly common winter visitant into the northern end of the territory. Authenticated instances of occurrence are as follows: Las Cruces, twenty miles east of Ensenada, January 5 and 6 (Grinnell and Lamb, 1927, p. 125); El Rayo and Laguna Hanson, in the Sierra Juárez, October 12 to 30, and Rancho San Pablo, ten miles southeast of Alamo, November 22 and 26 (Huey, 1927a, p. 154); Nachoguero Valley, November 19 to 28 (skins in Mus. Vert. Zool.). Bryant (1887a, p. 303), under the name *Passarella iliaca unalaschensis* [sic], records a bird taken by him on Guadalupe Island, February 16, 1886, this constituting even now our southernmost record for any subspecies of Fox Sparrow. The race represented by Bryant's bird cannot now be determined positively, since the skin was doubtless destroyed in the San Francisco fire of 1906; but I think, all things considered, it was most likely of the race *sinuosa*. The Bryant record is the first for any Fox Sparrow from Lower California.

Passerella iliaca unalaschensis (Gmelin)

Shumagin Fox Sparrow

Rare winter visitant at the north. One authenticated instance: a specimen obtained at La Grulla, 7200 feet altitude, Sierra San Pedro Mártir, September 28, 1926 (Huey, 1927a, p. 154).

Pipilo maculatus megalonyx Baird

San Diego Spotted Towhee

Common resident locally in the extreme northwestern portion of the territory, chiefly within the Upper Sonoran life-zone. Occurs south on the Pacific drainage from the United States boundary to about 32°, at about which latitude the mean of intergradation toward the subspecies *umbraticola* is passed. Spotted Towhees from, likely, within the Lower California range of this subspecies have been recorded under the name *Pipilo maculatus atratus*; for example, by Ridgway (1901a, p. 419). The record of a bird seen in spring on South Island, Los Coronados group (Osburn, 1909, p. 138), probably belongs here (see Howell, 1917, p. 86). Specimens which I refer definitely to *megalonyx* are in the Museum of Vertebrate Zoology from Tecate.

Pipilo maculatus umbraticola Grinnell and Swarth

Cape Colnett Spotted Towhee

A more or less common resident, locally, north of latitude 30°, from San Ramón, at the mouth of the Santo Domingo River, north, centrally, to very near the United States boundary, and east in the San Pedro Mártir section from the seacoast at Colnett to mouth of El Cajón Cañon at east base of the San Pedro Mártirs; reaches to an altitude of 7500 feet toward the tops of those mountains (Mus. Vert. Zool.). Most plentiful in the Upper Sonoran life-zone, but occurs on shaded ravine-sides within predominately Lower Sonoran territory, and also up into Transition; belongs to the chaparral association. Spotted Towhees of this race were first recorded, under the name *Pipilo maculatus megalonyx*, by

Bryant (1889b, p. 303) from the Sierra San Pedro Mártir on authority of Anthony; the subspecies *umbraticola* was named by Grinnell and Swarth (1926b, p. 131), with type [no. 46390 in Mus. Vert. Zool.] from Colnett, taken by J. Grinnell, October 28, 1925. Other published records are: San Pedro Mártirs (Anthony, 1893, p. 242); La Grulla [7000-7500 feet], Concepción [6000 feet], Valladares [2700 feet], San José [2500 feet], San Telmo, and Santo Domingo

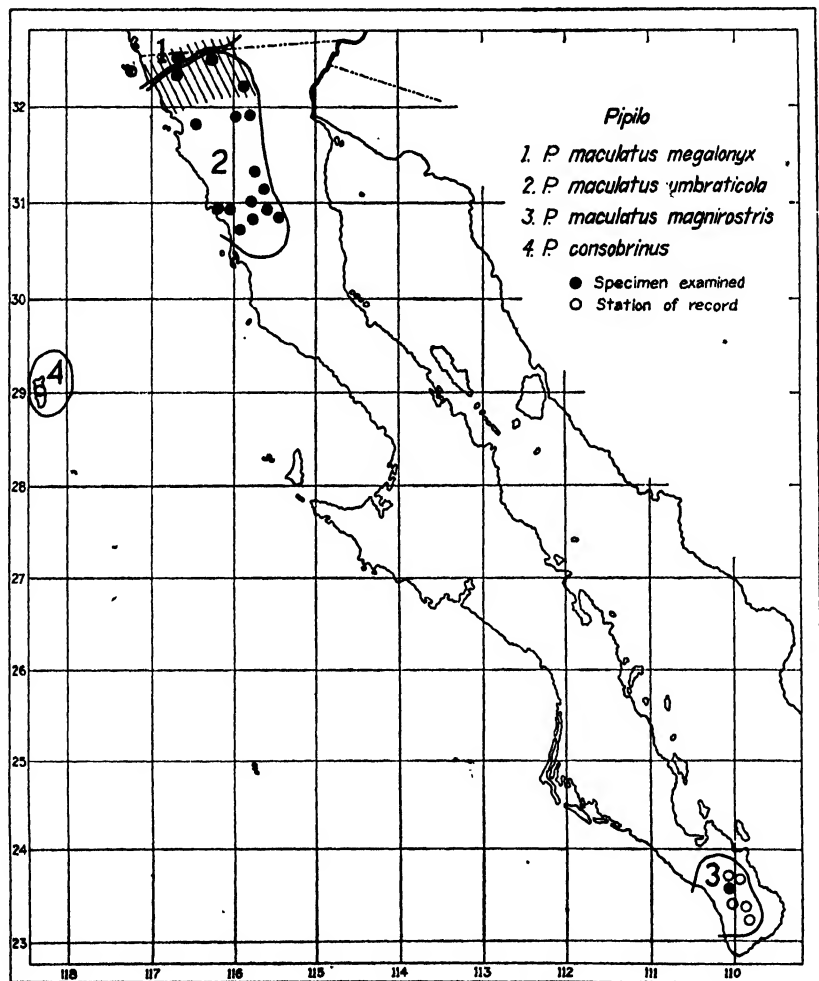


Fig. 14. Distribution of Spotted Towhees, part of genus *Pipilo*, in Lower California. Intergradation between races shown by shading.

(Grinnell and Swarth, *loc. cit.*); Sierra Juárez (Huey, 1926, p. 358). In the Museum of Vertebrate Zoology are specimens from additional localities, as follows: El Valle de la Trinidad, 2500 feet; Laguna Hanson, 5200 feet, El Rayo, 4700 feet, and Los Pozos, 4200 feet, in the Sierra Juárez; Nachoguero Valley, 3400 feet, close to the United States boundary; south end of Valle de las Palmas, 1200 feet; Las Cruces, 2600 feet, twenty miles east of Ensenada.

***Pipilo maculatus magnirostris* Brewster**

Large-billed Spotted Towhee

Common resident of mountainous portions of the Cape district. Appertains to brushy tracts chiefly within the Upper Sonoran life-zone. A few come down to sea level in winter (C. C. Lamb, MS). First recorded by Belding (1883b, p. 549, under the name *Pipilo maculatus megalonyx*) from Miraflores; the subspecies described by Brewster (1891, p. 146), with type [now no. 216070 in Mus. Comp. Zool.] from the Sierra de la Laguna, where taken by M. A. Frazar, May 21, 1887. Northernmost known station of occurrence, Triunfo (Brewster, 1902, p. 151); southernmost, Miraflores (Belding, *loc. cit.*) [not San José del Cabo as given by Bryant, 1889b, p. 303]. Other references of note are: Belding, 1883c, p. 348 (from Victoria Mountains); Thayer, 1909a, p. 11 (nesting on Sierra de la Laguna); Townsend, 1923, p. 20 (from San Bernardo Mountain). This form has been recorded also under the name *Pipilo megalonyx* (Salvin and Godman, 1886, p. 409).

***Pipilo consobrinus* Ridgway**

Guadalupe Spotted Towhee

Resident, formerly, on Guadalupe Island; inhabited the cypress grove on the highest part of the island. Believed to be now extinct. First recorded, and named, by Ridgway (1876b, p. 189, under the name *Pipilo maculatus consobrinus*); type is no. 70028 in U. S. Nat. Mus., taken by Edward Palmer, February 20, 1875 (*ad* C. W. Richmond). Important references, besides the above, are: Ridgway (1877, p. 62); Bryant (1887a, p. 303); Lucas (1891, p. 220); Gaylord (1897a, p. 42). The last time any individual of this species is recorded as seen alive was in June, 1897 (Thoburn, 1899, p. 278). Concerning extinction see: Anthony (1901, p. 73); Thayer and Bangs (1908, p. 106); Huey (1924b, p. 581).

***Pipilo fuscus crissalis* (Vigors)**

California Brown Towhee

Common resident at the extreme north, in the San Diegan district, where belonging chiefly to the chaparral association of the Upper Sonoran life-zone. Intergradation with the race *senicula* probably finds its mean shortly north of about latitude 32°. Brown Towhees referred by me to the subspecies *crissalis* are in the Museum of Vertebrate Zoology from Tecate; but admittedly they are intermediates showing marked inclination toward *senicula*.

***Pipilo fuscus senicula* Anthony**

Anthony Brown Towhee

Common resident of the northwestern portion of the territory, extending from the seacoast interiorly to the middle western slopes of the Sierra San Pedro Mártir and Sierra Juárez; reappears locally at the eastern base of the former mountains: El Cajón Cañon at 3200 feet (Mus. Vert. Zool.). Most plentiful in an open or interrupted type of chaparral, in the Upper and Lower Sonoran life-zones. This subspecies, in fairly typical form, extends north interiorly to Nachoguero Valley, latitude 32° 35' (Mus. Vert. Zool.), and south, not typically, as far as Yubay, latitude 29° 20' (Oberholser, 1919, p. 211). Brown Towhees of this race were first recorded by Belding (1883a, p. 528, under the name *Pipilo fuscus crissalis*), from San Quintín Bay. The subspecies was named by Anthony (1895c, p. 111), with type [now no. 15582 in Carnegie Mus.] taken by himself, January 10, 1894, at San Fernando (see Grinnell and Swarth, 1926a, pp. 427-31).

There is a record (Kaeding, 1905, p. 136) from Todos Santos Islands, March 10, 1897, but probably only of a straggler (see Van Denburgh, 1924, p. 71, under the name *Pipilo crissalis senicula*). Other notable records are: San Pedro Mártir (Anthony, 1893, p. 242); Colnett (Willett, 1913, p. 23); Santo Domingo (Anthony, 1925, p. 300). Specimens representing other localities than as mentioned above are contained in the Museum of Vertebrate Zoology as follows: San Ramón, San Telmo, San José [2500 feet], Valladares [2700 feet], Concepción [6000 feet], El Valle de la Trinidad [2500 feet], Los Pozos [4200 feet], Rancho Ojos Negros [2200 feet], Las Cruces [2600 feet, twenty miles east of Ensenada]; south end of Valle de las Palmas [1200 feet]; five miles south of Monument 258. Specimens from the last named two places incline in characters toward the subspecies *crissalis*.

***Pipilo fuscus aripolius* Oberholser**

San Pablo Brown Towhee

Common resident, locally, in the middle portion of the peninsula, mostly within the Vizcaino district. Life-zone, Lower Sonoran. Recorded from Playa María Bay, latitude 28° 55', where not typical (inclining towards *crissalis*), south as far as Guajademe, about latitude 26° 35' (see Oberholser, 1919i, pp. 210-211). Brown Towhees of this race were first recorded definitely, with critical comment, by Thayer and Bangs (1907c, p. 140, under the name *Pipilo crissalis senicula*) from Santana and San Jabier. The record by Kaeding (1905, p. 136, under *Pipilo fuscus senicula*, in part) from Playa María Bay belongs here; I have examined the specimen taken, now in the Carnegie Museum. In part, this form has been called *Pipilo fuscus albigula*, as by Nelson (1921, p. 34) in recording it from San Ignacio, and by Bryant (1889b, p. 304) when he says he found it "as far north as lat. 30°." The subspecies *aripolius* was named as new by Oberholser (1919i, p. 210), with type [no. 196605 in U. S. Nat. Mus.] from San Pablo, latitude 27° 40', where taken by E. W. Nelson and E. A. Goldman, October 3, 1905. The small series in the Museum of Vertebrate Zoology represents the following localities: near shore of Santa Rosalia Bay; Rancho Mesquital, 33 miles west of Calmallí; San Ignacio.

***Pipilo fuscus albigula* Baird**

San Lucas Brown Towhee

Common resident, locally, in the Cape district, where occurring chiefly in brushy parts of the Lower Sonoran and Arid Tropical life-zones. Recorded from Rancho Santo Domingo, latitude 25° 30', where not typical, inclining toward *aripolius* (Oberholser, 1919i, p. 211), southward to Cape San Lucas, whence first recorded, and originally named, by Baird (1859, p. 305, under the name *Pipilo albigula*) from specimens taken there by Xantus; the type is no. 12993 in U. S. Nat. Mus., taken in April, 1859 [fide C. W. Richmond, MS]. Curiously, no Brown Towhees whatsoever have been found on any of the Lower California islands save Todos Santos near Ensenada (where *P. f. senicula* has been observed casually). The race *Pipilo fuscus jamei* (Townsend, 1923, p. 20) was described from Tiburón Island, an island that is close to the Sonoran shore of the Gulf and not properly to be included in the Lower Californian province. Other notable ascriptions of *Pipilo fuscus albigula* as now restricted are: Cape region generally (Belding, 1883b, p. 540, and 1883c, p. 345); La Paz (Sharpe, 1888, p. 755); eggs (Bendire, 1890, p. 23); San José del Cabo, Triunfo, San José del Rancho, and Sierra de la Laguna [rare on top] (Brewster, 1902, p. 151); Miraflores, and San Bernardo Mountain (Townsend, loc. cit.). A skin in the Museum of Vertebrate Zoology was taken at San José [del Cabo] by John Xantus in May, 1860.

***Pipilo aberti* Baird**

Abert Towhee

Common resident of parts of the Colorado delta, whence first recorded by Price (1899, p. 93). Occurs south to the vicinity of El Major on the Hardy River (specimens in Mus. Vert. Zool.), and west from the Colorado River twenty miles

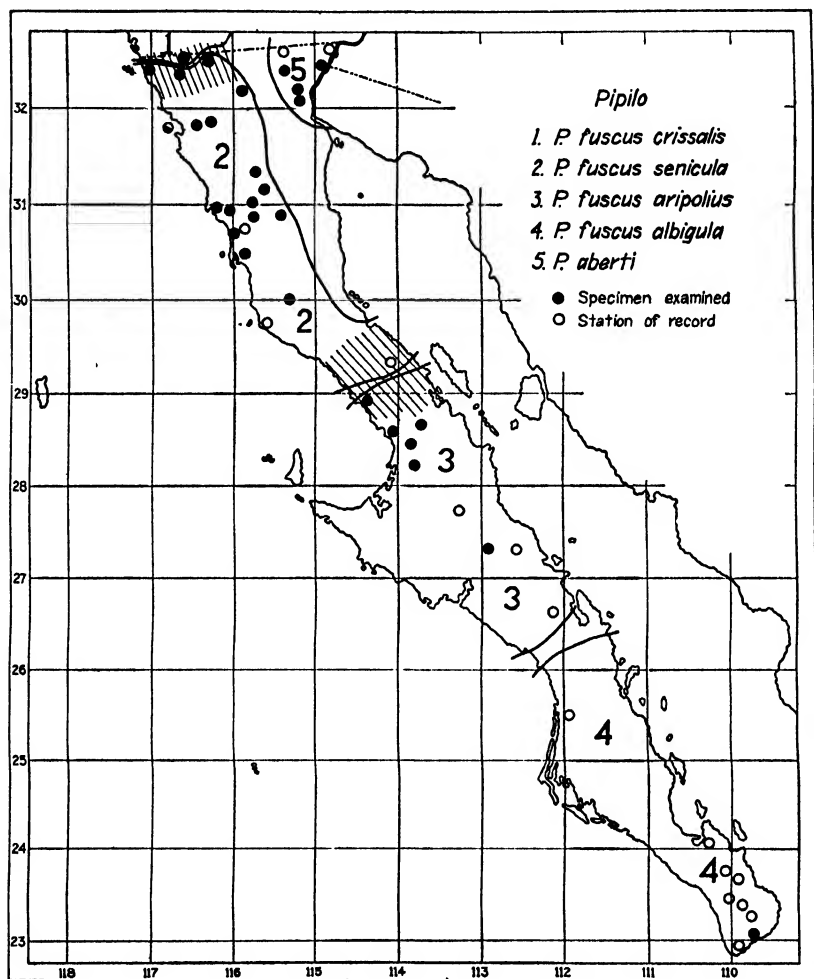


Fig. 15. Distribution of Brown Towhees, part of genus *Pipilo*, in Lower California. Intergradation between races shown by shading.

south of Pilot Knob (Mus. Vert. Zool.) to the neighborhood of Mexicali (Bancroft, 1922, p. 98) and to the base of the Cocopah Mountains (Stone and Rhoads, 1905, p. 685). Additional localities are: five and seven miles east of Cerro Prieto (skins and eggs in Mus. Vert. Zool.). Restricted to "the outer associations of the riparian belt" (Murphy, 1917, p. 96).

***Oberholseria chlorura* (Audubon)**

Green-tailed Towhee

Common in winter in the Cape district where found both on wooded mountain sides and among the mesquites in the lowlands. Recorded at that season north to La Paz (Brewster, 1902, p. 154, under the name *Oreospiza chlorura*). Occurs sparingly elsewhere on the peninsula as a migrant; some localities are: San Jabier, March 30 (Thayer and Bangs, 1907c, p. 140); Santo Domingo, latitude 30° 45', February 25 and 28 (Huey, 1926, p. 358); near Valladares, latitude 31°, April 16 and 29 (Mus. Vert. Zool.); La Grulla, Sierra San Pedro Mártir, October 2 (Mus. Vert. Zool.); San Felipe Bay, April 12 (Mus. Vert. Zool.); Colorado River at latitude 32° 15', March 5 (Mus. Vert. Zool.); near Mexicali, March 16 (Mus. Vert. Zool.). The only island records are for Santa Margarita [in February] (Bryant, 1889b, p. 304) and Angel de la Guardia, May 1 (Mailliard, 1923, p. 455). First recorded by Belding (1883b, p. 540, under the name *Pipilo chlorurus*), from the Cape region. Other Cape district records are: Victoria Mountains, in February (Belding, 1883c, p. 348); San José del Cabo, April 22 (Kaeding, 1905, p. 136); Cape San Lucas and La Paz, in March (Townsend, 1923, p. 20).

***Richmondia cardinalis ignea* (Baird)**

San Lucas Cardinal

Common and widely occurring resident of the lowlands of the Cape district; thence occurs more locally north to the vicinity of San Ignacio. Northernmost definitely known station of occurrence on the peninsula, San Pablo Mission, latitude 27° 40' (Nelson, 1921, p. 32), though Bryant (1889b, p. 304) says Cardinals have been met with nearly to latitude 29°. Island stations, on the Gulf side: Carmen (Townsend, 1923, p. 21) and San Josef (Mailliard, 1923, p. 455); on the Pacific side: Santa Margarita (Bryant, *loc. cit.*, and Anthony, 1925, p. 300). Some mainland localities of occurrence are, beginning at the north: San Ignacio, and San Lucas [on the Gulf, lat. 27° 15'] (specimens in Mus. Vert. Zool.); Concepción Bay (Townsend, *loc. cit.*); Comondú (Bryant, *loc. cit.*); La Paz, Triunfo and San José del Cabo (Brewster, 1902, p. 156); Santa Anita (Mus. Vert. Zool.). First recorded and originally named by Baird (1859, p. 305, under the name *Cardinalis igneus*) from specimens taken by Xantus at Cape San Lucas; the type [no. 26510 in U. S. Nat. Mus.] was taken in April, 1859 [*vide* C. W. Richmond, MS]. Other name combinations applied to this bird have been: *Cardinalis virginianus igneus* (Belding, 1883b, p. 541, and others), *Cardinalis ruber igneus* (Stejneger, 1884, p. 172), and *Cardinalis cardinalis igneus* (Ridgway, 1885d, p. 344, and many other authors).

***Pyrrhuloxia sinuata peninsulæ* Ridgway**

San Lucas Pyrrhuloxia

Common resident of the Cape district proper, occurring but sparingly to the northward of latitude 24°. Northernmost station of known occurrence, near El Potrero, about latitude 26° 40' (Nelson, 1921, p. 36). Of very local restriction, affecting chiefly the mesquite association. First recorded by Baird (1859, p. 304, under the name *Pyrrhuloxia sinuata*) from specimens taken at Cape San Lucas by Xantus. The subspecies was described by Ridgway (1887b, p. 347), with type [no. 87547 in U. S. Nat. Mus.] from San José del Cabo, where taken by Lyman Belding, April 13, 1882. Other definitely known stations of occurrence are: La Paz, Triunfo, Santiago, and San José del Rancho (Brewster, 1902, p. 157); Todos Santos, latitude 23° 27' (Mus. Vert. Zool.).

Zamelodia melanocephala capitalis (Baird)

Pacific Black-headed Grosbeak

Occurs widely as a spring and fall migrant throughout the whole length of the peninsula, and from coast to coast. Present, also, through the summer, and breeds, in the northwestern portion of the peninsula from the United States boundary south to the western flank of the Sierra San Pedro Mártir (Anthony, 1893, p. 242; Bryant, 1889*b*, p. 304; Mus. Vert. Zool.). Seems to prefer the willow and live-oak associations within the Upper Sonoran life-zone. Has also been found in small numbers throughout the winter in the Cape district, north to San José del Rancho and La Paz [obtained by Frazer from July 22 to May 4] (Brewster, 1902, p. 159). The only island whence recorded is Cedros, as a migrant in April (Belding, 1883*a*, p. 531, and Thayer and Bangs, 1907*b*, p. 79). Some mainland localities of known occurrence are: Comondú, April 22, Valle de la Trinidad, "breeding," and San Rafael, east of Ensenada (Bryant, *loc. cit.*); San Fernando, "migrant" (Anthony, 1895*d*, p. 141); Agua Verde Bay, April 12, Concepción Bay, April 2, and Miraflores, May 10 (Townsend, 1923, p. 21); Las Cabras and vicinity of Ensenada, breeding (Huey, 1926, p. 358); Valladares, 2700 feet, April 15 to 22, and Santo Tomás, 6000 feet, Sierra San Pedro Mártir, June 4 (Mus. Vert. Zool.); Colorado delta, seven miles east of Cerro Prieto, one specimen, May 24 (Mus. Vert. Zool.). First recorded from Lower California by Baird (1859, p. 304, under the name *Guiraca melanocephala*) from specimens taken by Xantus at Cape San Lucas. Other names and combinations in the Lower California synonymy of the species are: *Goniaphea melanocephala*, *Zamelodia melanocephala*, *Habia melanocephala*, and *Hedymeles melanocephalus melanocephalus*; this latter is, in the opinion of Oberholser (1919*g*, p. 408), the more correct one to use, though I am yet in doubt.

Guiraca caerulea salicarius Grinnell

California Blue Grosbeak

A migrant throughout the peninsula, for the most part sparingly. Also, present in summer, and probably breeds, at low levels in the northwestern coastal districts from San Quintín northward (Belding, 1883*a*, p. 528, under the name *Guiraca caerulea*, Anthony, 1893, p. 243, under the name *Guiraca caerulea eurhyncha*, and Huey, 1926, p. 358), and east to San José, latitude 31° (Mus. Vert. Zool.). Belongs in the breeding season to willow bottoms. Also, present through the winter in the Cape district: San José del Cabo, in spring (Belding, 1883*b*, p. 546); San José del Rancho, December 20, and San José del Cabo, August 28 to November 4 (Brewster, 1902, p. 160, under the name *Guiraca caerulea lasula*). Some other localities not mentioned above are: vicinity of San Telmo (Anthony, *loc. cit.*); Santo Tomás [lat. 31° 35'], San Vicente, and Guadalupe Valley, April 26 to June 4 (specimens in Carnegie Museum taken by A. W. Anthony); Comondú, in spring (Bryant, 1889*b*, p. 305); near El Major in Colorado delta, April 29, and seven miles east of Cerro Prieto, May 28 (Mus. Vert. Zool.). First recorded from Lower California by Heermann (1859, p. 51, under the name *Coccyborus caeruleus*).

Guiraca caerulea interfusa Dwight and Griscom

Arizona Blue Grosbeak

Common summer resident locally in the Colorado delta, where restricted to the riparian brushlands. The Museum of Vertebrate Zoology contains a series from seven miles east of Cerro Prieto, taken by C. C. Lamb, May 22 to June 15, 1928.

It was probably this subspecies, at least in part, that Murphy (1917, p. 96, under *Guiraca caerulea lasula*) found on the Hardy River, April 26, 1915. The only record of this race occurring to the southward of the delta region is for "Cape San Lucas," "in winter" (Dwight and Griscom, 1927, p. 4). The basis of this record, so I am informed by Mr. Ludlow Griscom, is a specimen (no. 39810, coll. J. Dwight, Jr.) from San José del Cabo, taken April 23, 1897. This specimen I have been privileged to examine, and I agree in its identification as above, though I should consider its status probably best indicated as transient or vagrant.

***Passerina amoena* (Say)**

Lazuli Bunting

Occurs in fair numbers as a spring and fall migrant throughout the entire length of the peninsula, appearing then in very diverse sorts of places. Also, present in summer (and doubtless breeds) in the northwestern coastal district from San Quintín northward, and east to the Sierra San Pedro Mártir (Anthony, 1893, p. 243). Affects the willow association, especially along ravines in the vicinity of seepages. Also a few spend the winter in the Cape district, as at Triunfo [so early as August 15] and San José del Rancho (Brewster, 1902, p. 160, under the name *Cyanospiza amoena*), and at Todos Santos and El Oro (C. C. Lamb, MS). First recorded for Lower California by Belding (1883b, p. 541), from the Cape region. The only insular record is for Todos Santos Islands, near Ensenada, April 25 (Willett, 1913, p. 23). Some other stations of known occurrence are as follows: Comondú, in spring, "rare" (Bryant, 1889b, p. 305); Colnett, April 8 (Willett, *loc. cit.*); Concepción Bay, April 7, and San Francisco Bay, April 9 (Townsend, 1923, p. 21); San Felipe Bay, April 14, and El Major, April 27 (Mus. Vert. Zool.).

***Passerina versicolor pulchra* Ridgway**

Beautiful Varied Bunting

Restricted, apparently, to the extreme southern end of the Cape district, where present in considerable numbers in brushy parts of cultivated areas almost altogether in the lowlands. First recorded by Baird (1859, p. 304, under the name *Cyanospiza versicolor*) from specimens taken by Xantus at Cape San Lucas. The subspecies *Passerina versicolor pulchra* was described by Ridgway (1887a, p. 448) with type [no. 87540 in U. S. Nat. Mus.] taken by Lyman Belding, April 4, 1882, at Miraflores. Additional name combinations used for this bird have been: *Passerina versicolor*, *Cyanospiza versicolor pulchra*, and *Cyanospiza pulchra*. Northernmost station of known occurrence, Triunfo, latitude 23° 50' (Brewster, 1902, p. 162). Other definite places of known occurrence are: San José del Cabo (Belding, 1883b, p. 546, and other authors); Santiago, and San José del Rancho (Brewster, *loc. cit.*); San Bernardo Mountain (Townsend, 1923, p. 21); Todos Santos (Mus. Vert. Zool.). Because many more are seen in spring and summer than in winter, it is believed that there is a partial exodus at the latter season, to the Mexican mainland across the Gulf (Brewster, *loc. cit.*; Nelson, 1921, p. 123; C. C. Lamb, MS).

***Calamospiza melanocorys* Stejneger**

Lark Bunting

Winter visitant rather widely, and apparently in considerable numbers. Forages in open fields or out on the desert plains. First recorded by Baird (1859, p. 304, under the name *Calamospiza bicolor*) from the Xantus collections

from Cape San Lucas. Some other mainland localities of record are: United States boundary to Sierra San Pedro Mártir (Bryant, 1889*b*, p. 305); San José and Santo Domingo, about latitude 31° (Mus. Vert. Zool.); between El Rosario and San Fernando (Anthony, 1895*d*, p. 141); San Felipe (Huey, 1927*d*, p. 33); Santana, latitude 29° 15' (Thayer and Bangs, 1907*c*, p. 139); Ballenas Bay (Townsend, 1890, p. 136); San Ignacio (Mus. Vert. Zool.); Magdalena Plain [lat. 25°] (Nelson, 1921, p. 112); Pichilique Bay (Streets, 1877, p. 11); San José del Cabo (Brewster, 1902, p. 163). Island record stations are: Cedros (Kaeding, 1905, p. 136); Santa Margarita (Bryant, 1889*b*, p. 305); San Martín (Lamb, MS); Cedros, Santa Margarita, and Carmen (Townsend, 1923, p. 21); Angel de la Guardia (Streets, *loc. cit.*).

***Spiza americana* (Gmelin)**

Dickeissel

Two definite records of occurrence: Specimen taken by M. A. Frazar at San José del Cabo, September 27, 1887 (Brewster, 1902, p. 162); "seen once at Todos Santos [lat. 23° 27'] in October, 1923" (Lamb, 1927*b*, p. 157).

***Piranga ludoviciana* (Wilson)**

Western Tanager

Occurs throughout the year in one part or another of Lower California—most widely as a spring and fall migrant, restrictedly as wintering in the Cape district, and as summering, and probably breeding in the Transition Zone, in the Sierra Juárez and Sierra San Pedro Mártir at the north. Recorded first by Baird, Brewer and Ridgway (1874, I, p. 437, under the name *Pyranga ludoviciana*) from "Cape St. Lucas." The dates of the specimens sent by Xantus from that place to the Smithsonian Institution are given by Ridgway (*in* Belding, 1883*b*, p. 533) as September 27 to November 17. Other localities and dates, from south to north, are: San José del Cabo, April 5 (Lamb, 1927*b*, p. 157); Victoria Mountains [February?] and La Paz (Belding, 1883*c*, p. 347); Miraflores in November, and San José del Rancho, July 29 ["evidently nesting" but this very doubtful] and in December (Brewster, 1902, p. 163); Comondú, in April (Bryant, 1889*b*, p. 305); Cedros Island, in April (Willett, 1913, p. 23); San Telmo and Vallecito Creek, April 23 and 30 (specimens in Carnegie Museum taken by A. W. Anthony); Sierra San Pedro Mártir below 7000 feet [in May?] (Anthony, 1893, p. 243); San Antonio Ranch, at 2100 feet on Santo Domingo River, April 25, La Grulla, 7200 feet, October 10 to 15, and El Cajón Cañon at 3200 feet, east side of Sierra San Pedro Mártir, May 18 (specimens in Mus. Vert. Zool.); La Joya [= La Jolla], September 25 (Huey, 1927*a*, p. 154); Valladares Creek, June 25, near San Antonio del Mar, April 28, and "higher parts of" Sierra Juárez in June and July (Huey, 1926, p. 358); Los Coronados Islands, May 26 (Howell, 1910, p. 187, and 1917, p. 87); Colorado delta seven miles east of Cerro Prieto, May 24 (skin in Mus. Vert. Zool.).

***Piranga rubra rubra* (Linnaeus)**

Eastern Summer Tanager

There are records of three individuals, doubtless far vagrants, from within the territory of Lower California, as follows: One was captured October 12, 1913, in the cypress grove on the summit of Guadalupe Island (Kimball, 1922, p. 97). This specimen, which I have examined and whose identity I am able to confirm, is no. 610 in the H. H. Kimball collection now housed in the Southwest Museum, Los Angeles. The second occurrence was recorded by Huey (1927*a*, p. 154) under

the name *Piranga hepatica oreophasma*; a female specimen was shot September 25, 1926, from company of Western Tanagers in a live oak near La Joya (= La Jolla), about 6000 feet altitude on the western slope of the Sierra San Pedro Mártir. It is now no. 10827, San Diego Soc. Nat. Hist.; I have had the privilege of comparing it with appropriate material in Mus. Vert. Zool., with the result that I consider it to be a rather unusually colored example of *Piranga rubra rubra*, in which the ordinary green color of the female is strongly pervaded with carmine. Its measurements are those of *rubra*. The third occurrence, still more recently come to light, is of a specimen (now in Mus. Vert. Zool.) taken by J. Elton Green in Las Palmas Cañon, west side of Laguna Salada, October 30, 1927.

***Piranga rubra cooperi* Ridgway**

Cooper Summer Tanager

Fairly common summer resident, locally, in the northern portion of the Colorado delta. Life-zone, Lower Sonoran; restricted to the willow association. Apparently only transient or vagrant elsewhere. The Museum of Vertebrate Zoology contains a series of specimens taken by C. C. Lamb seven miles east of Cerro Prieto, May 29 to June 14, 1928. The two records hitherto published are: San José del Cabo, specimen obtained February 23, 1923 (Lamb, 1925*d*, p. 118); Santo Domingo [lat. 30° 45'], singing male heard [but not captured] June 6, 1925 (Huey, 1926, p. 358).

***Progne subis hesperia* Brewster**

Lower California Purple Martin

Summer resident here and there throughout the entire length of the peninsula, and noted as a transient at some interlying points. Breeds in all zones, from Arid Tropical at the south to high Transition at the north, nesting in either giant cactuses, palms, or coniferous trees, according to availability. Reported first by Baird (1859, p. 303, under the name *Progne purpurea*) as taken by Xantus at Cape San Lucas. Subsequently, Baird (1865, p. 277, under *Progne subis*) gave November 5, 1859, as the date of a Xantus-taken specimen—later, seasonally, than any other observer has reported the presence of the species in Lower California. Some of the breeding localities, given from south to north, are as follows: San José del Cabo, arriving as early as April 29 (Belding, 1883*b*, p. 547, and Lamb, 1927*b*, p. 157); La Paz (Lamb, *loc. cit.*); near San Ignacio (Mus. Vert. Zool.); San Fernando (Anthony, 1895*d*, p. 141); Cañón San Juan de Dios, near latitude 30° (Huey, 1926, p. 359); Sierra San Pedro Mártir, from Valladares, 2500 feet, to 8500 feet near Vallecitos (Anthony, 1893, p. 243, and Mus. Vert. Zool.); Laguna Hanson, Sierra Juárez (Bryant, 1889*b*, p. 306, and Huey, *loc. cit.*). Some stations for migrants or vagrants are: San Telmo (Mus. Vert. Zool.); San Ramón (Huey, *loc. cit.*); San Quintín Bay (Howell, 1911, p. 153); Triunfo and Sierra de la Laguna (Brewster, 1902, p. 164); Todos Santos, latitude 23° 27' (Lamb, *loc. cit.*); San José del Cabo (Bryant, 1891, p. 195). The subspecies was originally described by Brewster (1889, p. 92), with types [now nos. 215394–95 in Mus. Comp. Zool.] taken by M. A. Frazar on the Sierra de la Laguna, June 4, 1887. For discussion of racial characters, see Grinnell (1928*a*, p. 122).

***Petrochelidon albifrons albifrons* (Rafinesque)**

Northern Cliff Swallow

Common summer resident locally, and breeding, north of about latitude 30°. Occurs as a migrant elsewhere the whole length of the territory. First recorded

by Belding (1883b, p. 547, under the name *Petrochelidon lunifrons*) from San José del Cabo, where first seen April 29. Brewster (1902, p. 165) records the species as present at the same place, September 8 to October 7. I have examined the two Cape specimens (now nos. 215430-31 in Mus. Comp. Zool.) recorded by Brewster and commented upon by him as in certain respects peculiar. They are certainly unlike upper California birds of the same age; and I quite agree that there is strong likelihood of their representing a subspecies different from *albifrons* proper. But lack of satisfactory Mexican material prevents me from going farther with this case. To the northward the Cliff Swallow has been reported as follows: Magdalena Bay, migrants July 26, and San Quintín, nesting (Anthony, 1925, p. 300); San Fernando, migrating (Anthony, 1895d, p. 141); Colnett, in April (Willett, 1913, p. 23); La Grulla, Sierra San Pedro Mártir, nesting (Anthony, 1893, p. 243, and Mus. Vert. Zool.); San José, latitude 31°, nesting, Valladares, 2700 feet, April 20, and San Ramón, March 21 (skins in Mus. Vert. Zool.); San Ysidro, nesting (Bryant, 1889b, p. 306); San Felipe, April 9 (Huey, 1927d, p. 33); seven miles east of Cerro Prieto, Colorado delta, June 13 (Mus. Vert. Zool.).

Hirundo erythrogaster Boddaert

Barn Swallow

Common migrant, chiefly along the Pacific seacoast, the whole length of the territory; also a few breed at the extreme north. First reported by Bryant (1889b, p. 306, under the name *Chelidon erythrogaster*) as observed by Belding at San Quintín in May, and by himself at San Jorge [lat. 25° 44'] in March. Other definite occurrences are: Triunfo, April 24, and San José del Cabo, August 28 to October 10 (Brewster, 1902, p. 166); Sierra de la Laguna, August 21 (C. C. Lamb, MS); San Ignacio, April 20 (Mus. Vert. Zool.); "top" of Sierra San Pedro Mártir, and seacoast to the westward [probably in April and May] (Anthony, 1893, p. 243); San Quintín, about the 1st of May (Howell, 1911, p. 153); San Ramón, up to June 6 (Huey, 1926, p. 359); San Martín Island, April 23 (Willett, 1913, p. 23); Todos Santos Islands, April 15 to 20 (Howell, 1912, p. 191); Los Coronados Islands, nesting (Howell, 1917, p. 87); San Felipe, April 9 (Huey, 1927d, p. 33); Mexicali, April 24 (Murphy, 1917, p. 96). There is fair probability, from some of the evidence given by the above cited observers, that this swallow breeds locally along the northwestern coast south as far as near latitude 30° 30'.

Iridoprocne bicolor (Vieillot)

Tree Swallow

Winters in small numbers locally, at the lower levels, from one end of the territory to the other. First reported by Belding (1883b, p. 537, under the name *Tachycineta bicolor*) as "often seen in winter" in the Cape region. Curiously, other observers there have apparently failed to find any. From the Colorado delta region, recorded by Mearns (1907, p. 130) from Salton River, April 27 to 28, by Stone and Rhoads (1905, p. 685) from Bruce's ranch in February, and by Bancroft (1922, p. 98) from Don Lorenzo, southeast of Mexicali, in January. From the Pacific side, Howell (1911, p. 153) records the species from San Quintín about the first of May, and Willett (1913, p. 23) from Colnett, April 8. In the Museum of Vertebrate Zoology are specimens with following data: La Grulla, 7200 feet, Sierra San Pedro Mártir, October 11; Colnett, October 29; El Valle de la Trinidad, 2500 feet, November 15 and 24; five miles east of Cerro Prieto, February 3 and 7.

***Tachycineta thalassina lepida* Mearns**

Northern Violet-green Swallow

Common summer resident of mountainous areas in the northern fourth of the territory, chiefly north from latitude 30°. Life-zone mainly Transition, but breeds also in Upper Sonoran and, in one place, Lower Sonoran. Occurs to the southward in migration. Recorded, definitely this subspecies, first by Bryant (1889*b*, p. 306, under the name *Tachycineta thalassina*, in part) as having been found by Anthony nesting at Valladares, 2500 feet, and higher, in the Sierra San Pedro Mártir (see also Anthony, 1893, p. 243). Further reported occurrences are as follows: San Fernando, nesting (Anthony, 1895*d*, p. 142); Sierra Juárez, breeding, and San Ramón, on the coast, "as late as June 6" (Huey, 1926, p. 359); Colnett, April 8 (Willett, 1913, p. 24); La Paz, February 14, one specimen (Brewster, 1902, p. 167). This latter instance is the only verified one of this race for the Cape district, and it is quite possible that the large population at the north does not travel south along the peninsula, but goes across to the mainland of Mexico. There is a doubtful record for the Colorado delta, in February (Rhoads, 1905, p. 690). Specimens are in the Museum of Vertebrate Zoology, with following data: Vallecitos (7500 to 8500 feet), in June; La Grulla, 7200 feet, in May; El Cajón Cañon, 3200 feet, east side of Sierra San Pedro Mártir, May 25; San Telmo, April 3; San Ramón, March 24.

***Tachycineta thalassina brachyptera* Brewster**

San Lucas Violet-green Swallow

Common resident of the Cape district, and occurs thence northward, at least as a breeding bird, definitely to latitude 28° 40'. Apparently breeds in all the represented life-zones, though most numerous in Upper Sonoran. First reported from Lower California by Baird (1859, p. 303, and 1865, p. 299, under the name *Hirundo thalassina*) as obtained by Xantus at San José [del Cabo] near "Cape St. Lucas." The subspecies *brachyptera* was described by Brewster (1902, p. 167), with the type [now no. 215406 in Mus. Comp. Zool.] taken by M. A. Frazar in the Sierra de la Laguna, June 6, 1887. The same author records this swallow from La Paz (in winter), Triunfo, Santiago, and San José del Rancho; see also Belding (1883*b*, p. 537, under the name *Tachycineta thalassina*). Thayer (1909*a*, p. 10) reports it nesting near La Paz. To the northward, Bryant (1889*b*, p. 306, part) reports it nesting near Comondú, as does C. C. Lamb (MS, series of specimens in Mus. Vert. Zool.) from at and near San Ignacio. Townsend (1923, p. 22) records specimens from Espíritu Santo Island, April 18, Agua Verde Bay, April 2, and San Francisquito Bay, April 9. Thayer and Bangs (1907*c*, p. 139) establish the northernmost station to date, Santana [lat. 28° 40'], whence "extreme examples" of *brachyptera* were obtained by W. W. Brown, March 11.

***Riparia riparia riparia* (Linnaeus)**

Common Bank Swallow

The first, and to date the only satisfactory, record of this swallow from Lower California is that by Bryant (1891, p. 195, under the name *Clivicola riparia*), as follows: At San José del Cabo, "for a week" in the early part of September, 1890, he saw "a remarkable flight" of "thousands of swallows," in which this species was chiefly represented. It is thus likely that Bank Swallows pass to the southward along the peninsula route, in numbers at least some years. Rhoads (1895, p. 690) and Murphy (1917, p. 97) both report "*Riparia riparia*" from

the Colorado delta, in February and in April, but I think questionably; for neither mentions the Rough-winged Swallow, which is characteristic of that zone, fauna, and association, and now well known from that region on the basis of specimens collected.

***Stelgidopteryx ruficollis serripennis* (Audubon)**

Northern Rough-winged Swallow

Fairly common summer resident locally, mostly at low altitudes, in the northern fourth of the territory; occurs elsewhere irregularly as a transient. First reported by Bryant (1891, p. 195, under the name *Stelgidopteryx serripennis*) as observed by him in considerable numbers in the early part of September, 1890, in the vicinity of San José del Cabo. Brewster (1902, p. 170) records specimens taken at the same place, August 23 and 25, 1887; the collector, M. A. Frazar, noted it as "abundant" there, August 28 of that year. Howell (1911, p. 153) found the species nesting at San Quintín Bay. Huey (1927*d*, p. 34) took it at San Felipe, April 9, 1926; and the same collector (1928*a*, p. 158) found the species nesting, July 1, 1927, in El Valle de la Trinidad. Specimens are in the Museum of Vertebrate Zoology from La Grulla, 7200 feet, Sierra San Pedro Mártir, May 13, 1925 [no evidence of breeding], from El Major, on the Hardy River, Colorado delta, April 24 and 26, 1926, and from the Colorado River at 32° 15', March 5, 1928.

***Bombycilla cedrorum* Vieillot**

Cedar Waxwing

Winter visitant southward, irregularly so both as to time and locality, the whole length of the territory. Remains some years till June. Reported first by Baird (1866, p. 408, under the name *Ampelis cedrorum*) as having been found at Cape San Lucas in 1859 by Xantus. Other occurrences are: Cape region, "very rare" [in winter of 1881-82] (Belding, 1883*b*, p. 537); Guadalupe Island, January 28, 1886 (Bryant, 1887*a*, p. 305); San José del Rancho, December 22, 1887 (Brewster, 1902, p. 171); Comondú, April 7, 1888 (Bryant, 1889*b*, p. 306); Valladares [2700 feet, west base San Pedro Mártirs], May 4, 1893 (Anthony, 1893, p. 243); Santana, March 14 and 20, 1907 (Thayer and Bangs, 1907*c*, p. 139); Colorado delta [in February, 1905] (Rhoads, 1905, p. 690); San Telmo, June 4, 1923, and Santo Domingo, April 29 to June 18, 1925 (Huey, 1926, p. 359); La Grulla, 7200 feet, Sierra San Pedro Mártir, October 15, 1925 (J. Grinnell, MS). Specimens are in the Museum of Vertebrate Zoology as follows: San José, 2500 feet, latitude 31°, November 9, 1925; Los Pozos, 4200 feet, Sierra Juárez, October 28 and 31, 1926; San Ignacio, April 28, 1927.

***Phainopepla nitens lepida* Van Tyne**

Northern Phainopepla

Varyingly common throughout the territory save on the higher mountains; permanently resident wherever found except that it is a scarce species in winter on the Pacific slope north of latitude 30°. Breeding life-zone, Lower Sonoran, locally Upper Sonoran; prefers the mesquite association wherever this is to be found. First reported by Baird (1859, p. 303, under the name *Phainopepla nitens*) as taken by Xantus at [San Nicolás near] Cape San Lucas [October 10, 1859] (see Baird, 1866, p. 416). There is no known island record for this bird. Published records from mainland localities are so numerous that only a few are here given: La Giganta [near lat. 26°], Comondú, and Pozo Grande (Bryant, 1889*b*, p. 307); Victoria Mountains [lat. 26°], La Paz, Triunfo, and San José

del Rancho (Brewster, 1902, p. 171); Agua Verde Bay, and Miraflores (Townsend, 1923, p. 22); San Fernando, January and April (Anthony, 1895, p. 142); Ensenada, breeding (Huey, 1926, p. 359); San Felipe, breeding (Huey, 1927d, p. 34); various localities in Colorado delta, December, February and April (Price, 1899, p. 93, Stone and Rhoads, 1905, p. 685, and Murphy, 1917, p. 97). The following localities are represented by specimens in the Museum of Vertebrate Zoology: San Ignacio, April; San Felipe Bay, March; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir, May; San José, 2500 feet, latitude 31°, June; near Valladares, at 2600 feet, April; El Valle de la Trinidad, 2500 feet, December; Los Pozos, 4200 feet, Sierra Juárez, November; Las Palmas Cañon, west side Laguna Salada, October and November.

***Lanius ludovicianus gambeli* Ridgway**

California Loggerhead Shrike

This subspecies of shrike barely enters Lower California in permanent resident status, at the extreme northwest. Specimens of it are at hand (in Mus. Vert. Zool.) from Nachoguero Valley, near Tecate, south end of Valle de las Palmas, and five miles south of Monument 258, at the United States boundary. As a winter visitant (possibly individuals from north of California) it is thought to invade the peninsula its entire length in small numbers; Oberholser (1918a, p. 210) definitely records specimens of this race from Santo Domingo [lat. 28° 15'], September 27, Magdalena Island, November 24, and San José del Cabo, January 6. The "Gambel shrike" is ascribed to Espiritu Santo Island by Nelson (1921, p. 92) [as seen February 7]; but in absence of specimens the subspecies is now in doubt. It is possible also that the birds seen by Bryant (1886, p. 64, and 1887a, p. 306, recorded under the name *Lanius ludovicianus excubitorides*) on Cedros Island in January, and on Guadalupe Island in December, belonged to the subspecies *gambeli*; the same author later (1889b, p. 307) does record them under the name *gambeli*. But verification is impossible, since the one specimen obtained by him, indeed the only shrike ever taken on Guadalupe Island, so far as I know, was destroyed in the San Francisco fire.

***Lanius ludovicianus excubitorides* Swainson**

White-rumped Loggerhead Shrike

Common resident on the Colorado Desert, in the extreme northeastern corner of the territory. Life-zone, Lower Sonoran. Records are as follows: Colorado River bottom and adjacent mesa (Price, 1899, p. 93); mouth of Hardy River, Pescadero Slough, and "Mount Major camp" (Stone and Rhoads, 1905, p. 685, under the name *Lanius ludovicianus gambeli*); Pattie Basin, and near Mexicali (Murphy, 1917, p. 97); Don Lorenzo, southeast of Mexicali (Bancroft, 1922, p. 98). Specimens are in the Museum of Vertebrate Zoology from: El Major and thirteen miles north of El Major, on the Hardy River; Colorado River, twenty miles south of Pilot Knob; Alamo River, twenty miles southwest of Pilot Knob; seven miles east of Cerro Prieto; Las Palmas Cañon, west side Laguna Salada.

***Lanius ludovicianus grinnelli* Oberholser**

Grinnell Loggerhead Shrike

Fairly common resident of the San Quintín district. Occupies, roughly, the extent of country between latitudes 29° and 31° 30', chiefly on the Pacific drainage. Intergradation with the race *gambeli* probably takes place at about latitude 32°. Life-zones, Upper and Lower Sonoran. The subspecies was described by

Oberholser (1919*h*, p. 87) with type [no. 196162 in U. S. Nat. Mus.] from San Fernando, taken by E. W. Nelson and E. A. Goldman, September 4, 1905. Specimens are also recorded by this author from San Simón River (near San Quintín) and from Yubay [lat. 29° 20'] (the latter not typical, inclining toward *nelsoni*). In the Museum of Vertebrate Zoology are specimens of this race from Colnett, San Telmo, El Valle de la Trinidad, and San Felipe, on the Gulf (the last not

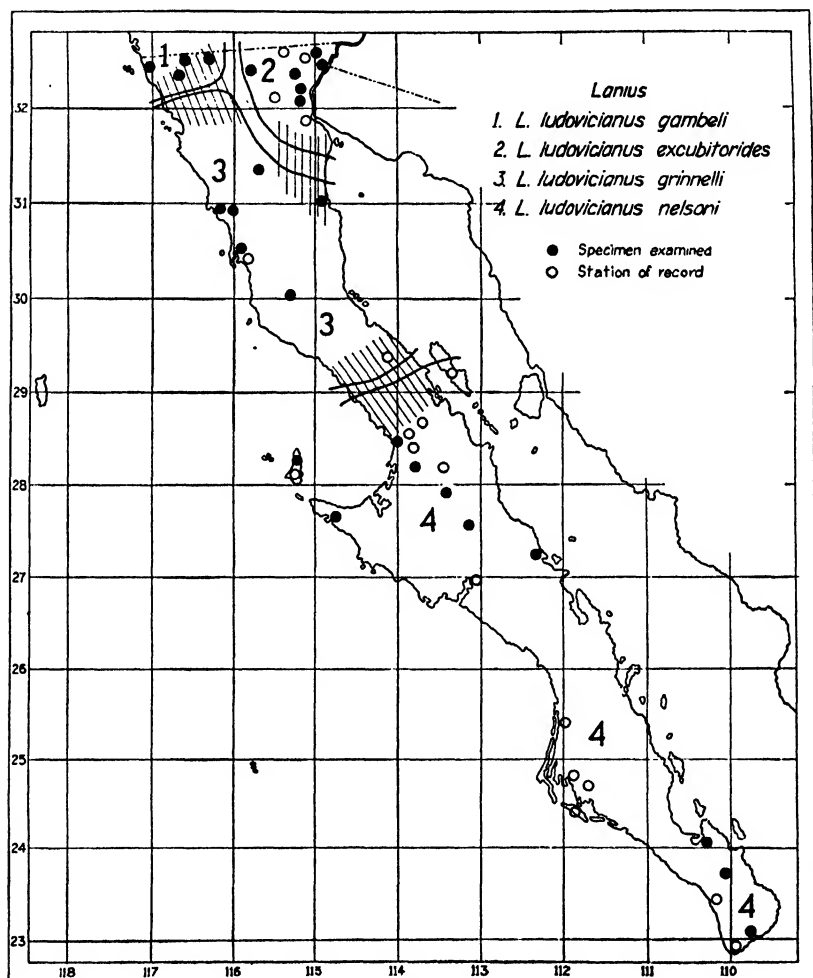


Fig. 16. Breeding ranges of Shrikes, genus *Lanius*, in Lower California. Intergradation between races shown by shading.

typical, inclining toward *excubitorides*). Huey (1927*d*, p. 34, under the name *Lanius ludovicianus excubitorides*) reports the nesting of shrikes at San Felipe. Earlier published records belonging here are: "Entire northwestern coast region," according to A. W. Anthony (Bryant, 1889*b*, p. 307, part, under the name *Lanius ludovicianus gambeli*); San Fernando (Anthony, 1895*d*, p. 142); San Quintín (Howell, 1911, p. 153).

***Lanius ludovicianus nelsoni* Oberholser**

Nelson Loggerhead Shrike

Common resident at the lower levels throughout the southern two-thirds of the territory; in other words, from the Cape north to 29°, at about which latitude intergradation with the race *grinnelli* takes place. Life-zones, Arid Tropical and Lower Sonoran. Shrikes belonging undoubtedly to this race were first recorded by Baird (1866, pp. 446-450, under the name *Collurio excubitoroides*) from San Nicolás near Cape San Lucas, as taken by Xantus. The subspecies *nelsoni* was named as new by Oberholser (1918*h*, p. 209) with type [no. 196172 in U. S. Nat. Mus.] from Todos Santos [lat. 23° 27'], taken by E. W. Nelson and E. A. Goldman, December 26, 1905. Oberholser (1918*h*, p. 210) gives additional localities: La Paz; Llano de Yrais; Santo Domingo [lat. 25° 30']; Santa Margarita Island; Calmallí; Rosarito [lat. 28° 35']. In the Museum of Vertebrate Zoology are specimens of this race from: La Paz; San Lucas [on the Gulf, lat. 27° 14']; thirty miles north of San Ignacio; twenty miles south, and thirty-three miles west, of Camallí; shore of Santa Rosalia Bay west of Trinidad Peak; and, provisionally this race, Cedros Island (one adult of date July 27 and molting—not positively determinable). Ascriptions to Santa Margarita Island under the name *Lanius ludovicianus mearnsi* (Ridgway, 1903, p. 108, and 1904, p. 252) and also, therefore, under *Lanius ludovicianus anthonyi* (A. O. U. Comm., 1910, p. 297) belong here (see Oberholser, 1918*h*, p. 209). Other notable published records applying here are: Cape region generally (Belding, 1883*b*, p. 537, under *Lanius ludovicianus excubitorides*); La Paz, Triunfo, and San José del Cabo (Brewster, 1902, pp. 172-173, under both *excubitorides* and *gambeli*); Juncal [near lat. 24° 45'] (Bryant, 1889*b*, p. 307); San Ignacio Lagoon (Huey, 1927, p. 240); Turtle Bay (Kaeding, 1905, p. 137); Santana, Rosarito, and San Jabier (Thayer and Bangs, 1907*c*, p. 139); Angel de la Guardia Island, April 11 (Townsend, 1923, p. 22) [exact subspecies is, I think, now doubtful].

***Vireo gilvus swainsoni* Baird**

Western Warbling Vireo

Fairly common breeding species in the higher parts of the Cape region (possibly a recognizable race there). Life-zone chiefly Upper Sonoran. One winter record. Occurs elsewhere through the whole length of the peninsula scatteringly as a migrant. Reported first by Belding (1883*b*, p. 549, under the name *Vireosylva gilva swainsoni*) from Miraflores, "moderately common May 9." Other published reports are: Comondú, April 12 (Bryant, 1889*b*, p. 307); Sierra de la Laguna, Triunfo and San José del Rancho, nesting, also one specimen from latter place, December 23 (Brewster, 1902, p. 174); Sierra de la Laguna, nesting (Thayer, 1909*a*, p. 11); Miraflores, April 25 and May 17, and San Bernardo Mountain, May 13 (Townsend, 1923, p. 22); San Fernando, migrant, "rare" (Anthony, 1895*d*, p. 142, under *Vireo gilvus*); San Felipe, April 12 (Huey, 1927*d*, p. 34). In the Carnegie Museum are Anthony-taken specimens from San Fernando, April 29, and Carrizo Valley [east of Tijuana], April 1. In the Museum of Vertebrate Zoology are skins with following data: Valladares [near lat. 31°], April 23; San José [near lat. 31°], September 27; San Felipe [on the Gulf], April 16. All these occurrences in the northern portion of the territory appear to be of transients.

Vireo solitarius cassinii Xantus

Cassin Solitary Vireo

Fairly common in summer on the Sierra San Pedro Mártir, and occurring elsewhere in the northern fourth of the territory as a migrant. Breeding life-zone, Transition. Reported first by Belding (1890, p. 201) from Tijuana, March 20. Anthony (1893, p. 244) found this vireo "not uncommon in the pines" on the Sierra San Pedro Mártir, May 13 and subsequently; specimens taken there by him May 14, 15, 19, are in the Carnegie Museum. (See also Nelson, 1921, p. 131, under the name *Lanivireo solitarius cassinii*.) In the Museum of Vertebrate Zoology are specimens with following data: La Grulla, 7200 feet, May 28; Valladares, 2700 feet, April 22; San José, 2500 feet, October 21; San Felipe, on the Gulf, April 16; El Major, in the Colorado delta, April 24 and 28. Probably all but the first of these occurrences are of transients.

Vireo solitarius lucasanus Brewster

San Lucas Solitary Vireo

Common resident in the Cape district proper, occurring in the breeding season chiefly at the higher altitudes. Life-zone, mainly Upper Sonoran. Recorded first by Baird (1866, p. 348, under the name *Vireosylva solitaria*) as taken by Xantus in January, 1861, on the "San Gertrude Mts." near Cape San Lucas. Belding (1883b, p. 546, under the name *Lanivireo solitarius cassinii*) reported it as "breeding" at San José del Cabo, and as "common" at Miraflores. The subspecies *lucasanus* was newly named by Brewster (1891, p. 147); type [now no. 215504 in Mus. Comp. Zool.] from San José del Rancho, taken by M. A. Frazar July 15, 1887. Further published definite records are: Bryant (1889b, p. 307, under *Vireo solitarius cassinii*), quoting Belding as above; La Paz [northernmost known station of occurrence], Triunfo, San José del Rancho, Miraflores, and San José del Cabo (Brewster, 1902, p. 175); Rayitas, Lázaro Mountain, etc. (Ridgway, 1904, p. 175, under *Lanivireo solitarius lucasanus*); San Bernardo Mountain, etc. (Townsend, 1923, p. 22).

Vireo huttoni huttoni Cassin

California Hutton Vireo

Fairly common but extremely local resident on the Pacific slope, and altogether north of latitude 30°. Life-zone chiefly Upper Sonoran. Rhoads (1893, p. 241) ascribed this vireo to "Lower California in winter," but upon what basis he does not say. In the Carnegie Museum is a specimen taken by A. W. Anthony in Burro Cañon [north of Ensenada], June 5, 1893. In the Museum of Vertebrate Zoology are ten specimens, of data as follows: San Ramón, at mouth of Santo Domingo River, March and December; San José, 2500 feet, October; Valladares, 2700 feet, April; Las Cruces, twenty miles east of Ensenada, January; south end of Valle de las Palmas, January.

Vireo huttoni cognatus Ridgway

San Lucas Hutton Vireo

Common resident locally in the mountains of the Cape district proper. Life-zone, Upper Sonoran. Reported definitely first by Belding (1883c, p. 347, under the name *Vireo huttoni stephensi*) as "common above 3000 feet" in the Victoria

Mountains. Coues had previously (1872, p. 123) ascribed "*Vireo huttonii*" to "Lower California," but obviously by a slip for southern California. The subspecies *cognatus* was described by Ridgway (1903, p. 107, and 1904, p. 199), with type [now no. 215527 in Mus. Comp. Zool.] from Sierra de la Laguna, taken by M. A. Frazar, May 5, 1887. Further published ascriptions are: Triunfo, and Sierra de la Laguna (Rhoads, 1893, p. 239); San José del Rancho, Triunfo, etc. (Brewster, 1902, p. 176); Sierra de la Laguna, breeding (Thayer, 1909a, p. 11, using the vernacular "Frazar Vireo").

Vireo bellii pusillus Coues

Least Bell Vireo

Common summer resident, and breeding, in Lower Sonoran and, locally, Upper Sonoran life-zones north from about latitude 30° to the United States boundary. Winters in the Cape district, and occurs as a transient in the intervening territory. Reported first, and newly named, by Coues (1866, p. 76, under the name *Vireo pusillus*); type [now no. 16956, not "16954," in U. S. Nat. Mus.] from "Cape St. Lucas," taken by J. Xantus, August 16, 1859 [*vide* C. W. Richmond, MS.]. Baird (1866, p. 360) records Xantus-taken skins from San José [del Cabo] and Sierra "San Gertrude," in vicinity of Cape San Lucas. Subsequent published records are numerous; some of them are: Santa Margarita Island in winter, Comondú in March, San Benito [lat. 26° 35'] in April, El Rosario May 21, and San Fernando in May (Bryant, 1889b, p. 308); Triunfo in April, Santiago in November, and San José del Cabo, August 30 to November 11 (Brewster, 1902, p. 176); Santana, March 17 (Thayer and Bangs, 1907c, p. 139); Santa Cruz Island, April 16 (Townsend, 1923, p. 22); San Fernando, nesting (Anthony, 1895d, p. 142); west base of Sierra San Pedro Mártir, below 4500 feet [in April and May] (Anthony, 1893, p. 244). In the Museum of Vertebrate Zoology are specimens of following data: Todos Santos [lat. 23° 27'], November 15; San Ignacio, April 19; San Ramón, mouth of Santo Domingo River, March 24 and 25; San Telmo, March 30; Valladares, 2700 feet, April 15 and 22; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir, May 17 to 26; seven miles east of Cerro Prieto, June 2 and 12. In the Carnegie Museum are Anthony-taken skins from northwestern localities, toward the United States boundary, as follows: Guadalupe, June 2; Guadalupe Valley, April 28; Valle de las Palmas, April 5 and 6; Carrizo Valley, April 20 and 21. As Brewster (*loc. cit.*) has gently but with seeming finality demonstrated, the name *Vireo bellii albatu* is a synonym of *V. b. pusillus* (see Grinnell, 1908, p. 85, and Ridgway, 1908, p. 224).

Vireo vicinior Coues

Gray Vireo

Sparingly summer resident locally in the northwestern section of the territory, north of 30° latitude. Life-zone Upper Sonoran, chaparral association. Occurs elsewhere scatteringly as a transient, possibly wintering in the Cape district. Recorded first by Bryant (1889b, p. 308) as having been found by Belding "south of Campo [California], at an altitude of 3,000 feet in May, 1884; near San Rafael in May, 1885, and the mountains east of Ensenada in April, 1887." Found by Huey (1928a, p. 158) breeding in some numbers near Ojos Negros, a little south of latitude 32° in San Rafael Valley. Brewster (1902, p. 177) records a specimen killed at Triunfo "the first week of April" and another at San José del Cabo on November 10. Thayer and Bangs (1907c, p. 139) report a bird from Santana, March 13. In the Museum of Vertebrate Zoology is a specimen from San Felipe, on the Gulf, taken by C. C. Lamb April 12, 1926.

***Mniotilta varia* (Linnaeus)**

Black-and-white Warbler

Rare winter visitant to the Câpe district. Four instances: Triunfo, December 20, 1887 (Brewster, 1902, p. 178); San José del Cabo, February 20, 1923, La Paz, September 28, 1923, and Todos Santos, November 6, 1923 (Lamb, 1927b, p. 157).

***Vermivora luciae* (J. G. Cooper)**

Lucy Warbler

Probably common as a summer visitant in the Colorado delta, most especially in tracts of mesquite. Life-zone, Lower Sonoran. One definite record: Specimens (two, now in Mus. Vert. Zool.) obtained by C. C. Lamb ten miles west of Pilot Knob and one mile south of the United States boundary, March 15 and 16, 1928; indications of breeding were noted.

***Vermivora ruficapilla gutturalis* (Ridgway)**

Calaveras Nashville Warbler

Occurs sparingly as a transient, chiefly or altogether within the northern fourth of the territory. First reported by Bryant (1889b, p. 308, under the name *Helminthophila ruficapilla gutturalis*) as having been seen by Belding "in spring" at Tijuana. Ridgway (1902, p. 470, under *Helminthophila rubricapilla gutturalis*) states that this warbler occurs "southward during migration to extremity of Lower California"; the details at the basis of this ascription are not known to me; Dr. C. W. Richmond tells me he knows of no specimen of this warbler, nor any record of it, in the U. S. National Museum. In the Carnegie Museum is a skin taken by A. W. Anthony, April 7, 1894, at "Gato Creek" [somewhere north of Ensenada]. In the Museum of Vertebrate Zoology is a specimen taken at Valladares, 2700 feet [near lat. 31°], April 17, 1925.

***Vermivora celata celata* (Say)**

Eastern Orange-crowned Warbler

Transient or winter visitant, the whole length of the territory, with scattering records as follows: San José del Cabo, specimen taken October 17, 1887 (Brewster, 1902, p. 178, under the name *Helminthophila celata*) [I have examined this skin, no. 15121 Brewster coll., and verified its original identification]; La Paz, specimen taken October 21, 1923 [now in Bishop coll.] (Lamb, 1927b, p. 157); Hole-in-the-wall [mainland shore ten miles southeast of Todos Santos Islands], specimen taken April 5, 1912 (Willett, 1913, p. 24) [this specimen, no. 1153 Willett coll., I have seen—it is *celata* as first recorded]; Colorado River, twenty miles south of Pilot Knob, October 14 and 19, 1927 (three skins in Mus. Vert. Zool.).

***Vermivora celata orestera* Oberholser**

Rocky Mountain Orange-crowned Warbler

Occurs sparingly in the Cape district through the winter, as well as elsewhere as a transient. Oberholser (1905, p. 244), in connection with his description of this subspecies, records specimens from "Gardiners Lagoon, Salton River," and from La Paz. The latter is the specimen long previously recorded by Belding (1883b, p. 535) under the name *Helminthophila celata* as collected at La Paz in January, 1882; I have examined it [now no. 86272, U. S. Nat. Mus.], and confirmed its identification as *orestera*. Among the suite of specimens taken by

M. A. Frazar in 1887, and recorded by Brewster (1902, p. 179) under the name *Helminthophila celata lutescens*, I find the following to be now identifiable as *orestera*: San José del Cabo, October 26, November 2; Santiago, November 24; La Paz, February 7, 8 and 14. In the Carnegie Museum is a skin taken by A. W. Anthony at San Fernando, April 29, 1894, which I consider good *orestera*. Two examples of this race are contained in the Museum of Vertebrate Zoology, taken on the Colorado River, twenty miles south of Pilot Knob, October 12 and 19, 1927.

***Vermivora celata lutescens* (Ridgway)**

Lutescent Orange-crowned Warbler

Rather common in winter in the Cape district; and more or less numerous as a migrant, elsewhere almost throughout the territory. Reported first by Baird (1864, p. 176, under the name *Helminthophaga celata*) as taken by Xantus at San José [del Cabo], November 25, 1859. Further definitely known occurrences are: Victoria Mountains, in the Cape district (Belding, 1883c, p. 347, under *Helminthophila celata lutescens*); La Paz (Sharpe, 1885, p. 247, under *Helminthophila lutescens*); San José del Rancho, Triunfo, etc., October 10 to February 9 [specimens examined by me] (Brewster, 1902, p. 179); Sierra "San Gertrude," La Paz, and Cape San Lucas (Oberholser, 1905, p. 246); Cape San Lucas, April 7 (Townsend, 1890, p. 137); Santa Margarita Island, March 17 and 18 (Townsend, 1923, p. 22); Santa Margarita Island in January, Comondú in March, San Benito Cañon [lat. 26° 35'], April 10, and El Rosario, May 21 (Bryant, 1889b, p. 308); Santana, March 11, and San Jabier, March 28 (Thayer and Bangs, 1907c, p. 139); San Felipe, March 26 and April 12 (Huey, 1927d, p. 34); San Fernando in April and May (Anthony, 1895d, p. 142, part); western base of Sierra San Pedro Mártir in spring migration (Anthony, 1893, p. 244); Colnett, April 8 (Willett, 1913, p. 24); North Island, Los Coronados group, April 8 (Osburn, 1909, p. 138, under *Helminthophila celata*); Bruce's ranch, in Colorado delta, February 16 (Stone and Rhoads, 1905, p. 685). In the Museum of Vertebrate Zoology are specimens of definitely *lutescens* from the San Pedro Mártir "section" as follows: San Telmo, April 5; San José, 2500 feet, September 28; La Grulla, 7200 feet, October 2 and 7; San Felipe, on the Gulf, April 12.

***Vermivora celata sordida* (G. H. Townsend)**

Dusky Orange-crowned Warbler

Common resident locally on certain islands along the northwestern seacoast, and probably also at points on the adjacent mainland. H. B. Kaeding (1905, p. 137, under the name *Helminthophila celata lutescens*) reported himself and A. W. Anthony finding "Lutescent" Warblers on Todos Santos Islands, March 10, 1897. I have examined a specimen of exactly that place and date in the Anthony collection in the Carnegie Museum, which is *sordida*. From the same group of islets, Howell (1912, p. 191), Willett (1913, p. 24) and Van Denburgh (1924, p. 71) record this warbler definitely and as nesting. Wright (1909, p. 100, under *Helminthophila celata sordida*) and Howell (1917, p. 91) report it as breeding on South Island, of Los Coronados group. In the Museum of Vertebrate Zoology are specimens from Todos Santos Islands, January 13 to 18, and one from San Ramón, at mouth of Santo Domingo River, March 21. In the L. B. Bishop collection are four specimens from El Rosario, of dates April 8 to 12. The latter point (lat. 30°) marks the southernmost station of known occurrence to date.

Compsothlypis graysoni* Ridgway*Socorro Warbler**

Of rare occurrence, possibly as a resident, in the Cape district, with records as follows, all made by C. C. Lamb (1925*a*, p. 36): Todos Santos, latitude 23° 27', specimens taken November 3, 1923, and July 23, 1924; El Oro, some thirty miles east of Todos Santos, one seen February 5, 1924.

Dendroica aestiva sonorana* Brewster*Sonora Yellow Warbler**

Fairly common in summer in the willow association of the Colorado Desert district; life-zone Lower Sonoran (A. O. U. Comm., 1910, p. 311, and Nelson, 1921, p. 126). The Museum of Vertebrate Zoology contains two breeding examples taken seven miles east of Cerro Prieto, June 1, 1928. Murphy's (1917, p. 97) record from the "Wash association on the western side of Pattie Basin, where a breeding male was taken April 5," pertained, at least in part, to another race, *brewsteri*, in migration; for I have so identified the specimen taken (now no. 10984, Brooklyn Mus.).

Dendroica aestiva brewsteri* Grinnell*California Yellow Warbler**

Fairly common summer resident locally on the Pacific slope north from about latitude 30° to the United States boundary. Breeds in willow-cottonwood association from Lower Sonoran to (presumably) Transition. To the southward, occurs as a migrant, and a few apparently winter in the Cape district. Yellow Warblers were recorded from Lower California first by Belding (1883*b*, p. 536, under the name *Dendroica aestiva*) from the Cape district, "rare," no dates given. Other records are: "Northwest coast up to 2,500 feet altitude" in spring, according to A. W. Anthony (Bryant, 1889*b*, p. 309); San Quintín, about May 1 (Howell, 1911, p. 153); Las Cabras and San José [lat. 31°] in June, and breeds "as far south as El Rosario" (Huey, 1926, p. 359); San Felipe, April 23 (Huey, 1927*d*, p. 35); western side of Pattie Basin, April 5 (Murphy, 1917, p. 97, under the name *Dendroica aestiva sonorana* [but I have examined the specimen taken]); San José del Cabo, April 24 (Kaeding, 1905, p. 137); La Paz, January and February, Triunfo, April 21, San José del Cabo, August 28 to October 27, and Santiago, November 16 (Brewster, 1902, pp. 179-181, under both *Dendroica aestiva* and *Dendroica aestiva sonorana*). I have examined Brewster's Yellow Warblers under these two names and all save one [which is *rubiginosa*] are *brewsteri*. Brewster had previously (1888*b*, p. 139) used the name *Dendroica aestiva morcomi* for Lower Californian birds. The only skin I could find in the Anthony collection in the Carnegie Museum was one of *brewsteri* from Valladares, September 8; there are specimens of good *brewsteri* in Mus. Vert. Zool. from the same place, April 18.

Dendroica aestiva rubiginosa* (Pallas)*Alaska Yellow Warbler**

Occurs sparingly as a spring migrant, apparently throughout the entire length of the peninsula. The only record previously published under this name is that by Brewster (1902, p. 181) of a specimen, in the National Museum, taken by Belding at San José del Cabo, April 17, 1882. A specimen which Brewster

(1902, pp. 179-181) mentions under both *Dendroica aestiva* and *Dendroica aestiva sonorana* (no. 15091, La Paz, February 5, 1887) I have closely examined and identified also as *rubiginosa*; so also with the skin [now no. 11006, Carnegie Mus.] recorded by Anthony (1893, p. 244, under *Dendroica aestiva*) from La Grulla, Sierra San Pedro Mártir, and taken May 15, 1893. In the Museum of Vertebrate Zoology are specimens positively of this race taken by C. C. Lamb as follows: La Grulla, 7200 feet, Sierra San Pedro Mártir, May 13, 1925; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir, May 20, 1926; El Major, in the Colorado delta, April 25 and 26, 1926; seven miles east of Cerro Prieto, May 23, 1928.

***Dendroica erithachorides castaneiceps* Ridgway**

Mangrove Golden Warbler

Common resident locally in the Cape district, and thence north along both coasts of the peninsula to the limit of growth of mangroves, about latitude 27°. This warbler is associated exclusively with the mangrove. Life-zone, therefore, [Arid] Tropical. First reported by Ridgway (1882a, p. 414, under the name *Dendroica vieillotii bryanti*) as taken by Belding at La Paz in January, 1882. Belding (1883b, p. 536) records his finding of it on Espíritu Santo Island and at Pichilínque Bay as well as at La Paz. The subspecies was originally separated by Ridgway (1885c, p. 350) under the name *Dendroica bryanti castaneiceps*, with one of Belding's La Paz specimens [no. 89940] in the United States National Museum, taken December 16, 1882, as type. Other reports are: La Paz, and San José [near La Paz], breeding (Thayer, 1909a, p. 10); La Paz (Brewster, 1902, p. 181); La Paz, and Santa María Bay (Townsend, 1923, p. 22); Santa Margarita Island, and "estero" north from Magdalena Bay (Bryant, 1889b, p. 309); Magdalena Bay (McLellan, 1926, p. 312); San Ignacio Lagoon (Bancroft, 1927b, p. 195, and Huey, 1927g, p. 241); Pond Lagoon (Huey, 1927g, p. 243). Specimens are in the Museum of Vertebrate Zoology from: La Paz; Espíritu Santo Island; San Lucas, May 9 to 12. The latter locality, latitude 27° 14' on the Gulf, is the northernmost station of occurrence now known. The ascription by Townsend (*loc. cit.*) to San José del Cabo [where mangroves do not occur] is probably an error, since there proves to be no specimen from there in the collections brought back to the American Museum of Natural History [*vide* Ludlow Griscom]. Merriam (1892, p. 29) treats of the faunal significance of this Lower Californian species. Oberholser (1919a, p. 85) deals with its systematic status.

***Dendroica coronata hooveri* McGregor**

Alaska Myrtle Warbler

Midwinter visitant, apparently fairly common at the extreme north, and likely occurring some years also well down the peninsula. Given by Oberholser (1918f, p. 466) as wintering south to "southern Lower California" (see also A. O. U. Comm., 1923, p. 523). I have not succeeded in learning the details at the basis of this ascription, save for the fact that there is (*vide* Oberholser, *in litt.*) at least one specimen of Myrtle Warbler in the National Museum from Lower California. In the Museum of Vertebrate Zoology are five skins of following data which I identify as of this form: Alamo River, twenty miles southwest of Pilot Knob, January 19, 25 and 30, 1928; five miles east of Cerro Prieto, Colorado delta, February 11 and 12, 1928 (all taken by C. C. Lamb or J. E. Green).

***Dendroica auduboni auduboni* (J. K. Townsend)**

Pacific Audubon Warbler

Abundant and widespread as a winter visitant over almost the entire territory, reaching also most of the islands. Occurs also in summer, and breeds, on the Sierra San Pedro Mártir, chiefly in the Canadian life-zone. First reported by Baird (1865, p. 188) from specimens taken by Xantus at or near Cape San Lucas, November 25, 1859. Subsequent records pertain to practically every locality in which collections of birds have been made in late fall, winter, or early spring. Only a few, seemingly most important ones will be cited here, as follows: Los Coronados Islands, April 3 to 10 (van Rossem, 1909, p. 208); Todos Santos Islands, March 10 (Kaeding, 1905, p. 137); Guadalupe Island, December 28 and January 12 (Bryant, 1887a, p. 307); Cedros Island, March 12, and at sea north of Guadalupe Island, April 25 (Townsend, 1923, p. 23); Natividad Island, "very common" in midwinter (Lamb, 1927a, p. 70); Santa Margarita Island [in January?] (Bryant, 1889b, p. 309); various localities in Cape district and elsewhere (Belding, 1883c, p. 347, Brewster, 1902, p. 182, and Oberholser, 1921b, p. 242). Probable or certain breeding stations are: Hansen's [Hanson Laguna, in the Sierra Juárez], May 14 (Bryant, 1889b, p. 309); La Grulla, Sierra San Pedro Mártir, May 13 (Anthony, 1893, p. 244); La Joya [La Jolla, 6000 feet], same mountains, June 9 (Huey, 1926, p. 359); Vallecitos, 7500 to 8500 feet, June 2 to 18, and La Corona, 8000[?] feet, May 25, same mountains (specimens in Mus. Vert. Zool.).

***Dendroica auduboni memorabilis* Oberholser**

Rocky Mountain Audubon Warbler

Winter visitant scatteringly the entire length of the peninsula. Definite instances of occurrence are: Ensenada, February 27, Comondú, November 9, and Cape San Lucas, November 12 (Oberholser, 1921b, p. 246); El Major (thirteen miles north of), in Colorado delta, April 29 (specimen in Mus. Vert. Zool.). It is likely that a number of the records of *Dendroica auduboni* for Lower California, especially the Colorado Desert district, pertain at least in part to the present race.

***Dendroica cerulea* (Wilson)**

Cerulean Warbler

Rare vagrant; one instance: La Grulla, 7200 feet, Sierra San Pedro Mártir, specimen (no. 46422, Mus. Vert. Zool.) taken by C. C. Lamb, October 2, 1925 (Grinnell and Lamb, 1927, p. 126).

***Dendroica nigrescens* (J. K. Townsend)**

Black-throated Gray Warbler

Common in summer at the north, on the Sierra Juárez and Sierra San Pedro Mártir; life-zone, Transition. Fairly common in winter in the mountainous parts of the Cape district. Scatteringly transient elsewhere. Reported first by Belding (1883c, p. 347) as common in the Victoria Mountains [in February]. Other occurrences are: La Paz, March 30, Triunfo in April, Sierra de la Laguna in November and up to April 27, and San José del Rancho in December (Brewster, 1902, p. 183); Sierra de la Laguna, August 3 (C. C. Lamb, MS); Hansen's [Laguna Hanson, Sierra Juárez], May 14, and Tijuana, May 2, according to Belding, and

Sierra San Pedro Mártir "where it breeds," according to Anthony (Bryant, 1889b, p. 309); Sierra San Pedro Mártir, "pine belt, nesting in the Manzanita thickets" (Anthony, 1893, p. 244); "abundant nester in the oak belt on Sierra Juárez" and west slope of Sierra San Pedro Mártir (Huey, 1926, p. 359); San Quintín, about May 1 (Howell, 1911, p. 153); Concepción Bay, April 8 (Townsend, 1923, p. 23); San Felipe, March 30 and April 11 (Huey, 1927d, p. 35); near Mexicali, March 30 (Murphy, 1917, p. 98). In the Museum of Vertebrate Zoology are specimens with following data: Colorado River at latitude 32° 15', March 2; San José, 2500 feet, October 25 and November 10; Valladares, 2700 feet, April 23; La Grulla, 7200 feet, May 18; Vallejos, at 7500 feet, June 13 and 16.

***Dendroica townsendi* (J. K. Townsend)**

Townsend Warbler

Occurs sparingly as a migrant, apparently throughout the entire length of the peninsula. Reported first by Belding (1883b, p. 549) on the basis of one seen at Miraflores, April 4, 1882. The same observer (Belding, 1890, p. 214) found this warbler at Tijuana, April 30 and May 2, 1885. Further published occurrences are: San Quintín, "in spring" according to Anthony (Bryant, 1889b, p. 309); Burro Cañon [north of Ensenada], April 23, and Valladares and west side of Sierra San Pedro Mártir, May 3 and 4, 1893 (Anthony, 1893, p. 244); San Fernando, May 7, 1894 (Anthony, 1895d, p. 142). In the Museum of Vertebrate Zoology are specimens as follows: San Antonio Ranch, on upper Santo Domingo River, 2100 feet, April 25, 1925; Valladares, 2700 feet, April 20, 1925; San José, 2500 feet, October 25, 1925; El Major, in Colorado delta, April 27, 1926.

***Dendroica occidentalis* (J. K. Townsend)**

Hermit Warbler

Of rather rare occurrence as a transient through the northern fourth of the peninsula, north from about latitude 30°. First reported by Bryant (1889b, p. 310) as having been found by Belding at Tijuana May 2 [also April 30, 1885: see Belding, 1890, p. 215], and by Anthony at San Quintín "in the fall." Anthony (1893, p. 245), on May 3 and 4, 1893, found this warbler "quite common" at Valladares and on the nearby western flank of the Sierra San Pedro Mártir. Anthony also (1895d, p. 142) took a specimen at San Fernando, May 16, 1894. Huey (1927d, p. 35) found the species at San Felipe, April 12, 1926. In the Museum of Vertebrate Zoology are skins with data as follows: Valladares, April 16 and 22, 1925; San Felipe, on the Gulf, April 12, 1926.

***Seiurus noveboracensis notabilis* Ridgway**

Alaska Water-thrush

Winter visitant, apparently rather common, to the southern third of the peninsula. Curiously, no instance is yet known from the territory north from near latitude 25° to the United States boundary. Belding (1883b, p. 536, under the name *Siurus naevius notabilis*, and 1890, p. 216) records two specimens from La Paz and one from Todos Santos, taken "in winter" [1882] (see also Bryant, 1889b, p. 310). Brewster (1902, p. 184) records five specimens taken by M. A. Frazar in 1887, "two at La Paz on January 11, one at Triunfo on April 21, and two at San José del Cabo, September 12 and 22"; also seen at latter place September 18 and October 4. Townsend (1923, p. 23) reports a specimen taken at Magdalena Bay, March 21, 1911. Ridgway (1902, p. 646) records specimens from La Paz, February 24, and San Pedro [six miles south of Todos Santos],

March 14; these are likely birds taken by Belding, as above. C. C. Lamb (MS) has taken many specimens at La Paz, and several at Todos Santos and El Oro; his earliest seasonal record is September 10, at La Paz, and his latest, February 4, at El Oro.

***Oporornis tolmiei* (J. K. Townsend)**

Tolmie Warbler

Common winter visitant to the Cape district, and occurs scatteringly as a transient elsewhere on the peninsula. First reported by Baird (1865, p. 227, under the name *Geothlypis macgillivrayi*) as having been taken by Xantus at Cape San Lucas, December 16, 1859. Other occurrences are: "mountain cañons" in the Cape district [in late winter] (Belding, 1883b, p. 536); San José del Cabo in the fall (Bryant, 1891, p. 192); San José del Rancho in November, Triunfo in November and on April 20, Santiago in November, and La Paz, February 16 (Brewster, 1902, p. 185, under *Geothlypis tolmiei*); Comondú in March (Bryant, 1889b, p. 310); Tijuana, April 20 (Belding, 1890, p. 216); San Ignacio, April 22, and Valladares, April 23 (specimens in Mus. Vert. Zool.).

***Geothlypis trichas occidentalis* Brewster**

Western Yellow-throat

Common locally in winter in the Cape district and also sparingly at points to the northward; much more widely, though more sparsely, distributed during the migrations. First recorded by Baird (1865, p. 220, under the name *Geothlypis trichas*) from a specimen taken by Xantus at Cape San Lucas, October 1 [1859]. Some other published records are as follows: Cape district, "common" in late winter (Belding, 1883b, p. 536); La Paz in March, San José del Rancho, December 22, and San José del Cabo, August 23 to November 13 (Brewster, 1902, p. 186, under *Geothlypis trichas arizela*) [I have examined the Brewster Cape series and identified it as a whole as *occidentalis*]; Santa Margarita Island, once [in February?] (Bryant, 1889b, p. 310); Magdalena Bay, March 20 and 21 (Townsend, 1923, p. 23); Cedros Island, April 1 (Kaeding, 1905, p. 137) [I have examined the bird taken, now in Carnegie Mus.]; San Jabier, March 28 and April 4 (Thayer and Bangs, 1907c, p. 139); La Grulla, Sierra San Pedro Mártir, May 1 (Anthony, 1893, p. 245) [the specimen taken, now in Carnegie Mus., is good *occidentalis*]. Skins in the Museum of Vertebrate Zoology come from: Valle de las Palmas, 1200 feet, January 5; five miles east of Cerro Prieto, February 12; El Valle de la Trinidad, December 14 and 17. Individual or age variation, or both, results in difficulty in assigning a number of specimens, as between this subspecies and *scirpicola*.

***Geothlypis trichas scirpicola* Grinnell**

Tule Yellow-throat

Common resident locally in the northern fourth of the territory, roughly from latitude 30° north to the United States boundary. Some evidence indicates breeding in the Colorado delta as well as on the Pacific slope. Records probably or certainly applying to this race are as follows: "northwest coast" (Bryant, 1889b, p. 310, part, under the name *Geothlypis trichas occidentalis*); San Fernando (Anthony, 1895d, p. 142); Tecate Valley, June (Oberholser, 1899b, p. 257, part, under *Geothlypis trichas arizela*); Colnett (Willett, 1913, p. 24); Las Cabras, San Ramón, and El Rosario, breeding (Huey, 1926, p. 359). Yellow-throats were seen on Los Coronados Islands, June 11, 1910 (Howell, 1910, p. 187, and 1917, p. 94), but their subspecies is problematic. Specimens of *scirpicola*

are in the Museum of Vertebrate Zoology from: San Ramón; San Telmo; San José, 2500 feet; El Valle de la Trinidad; San Felipe [April 12 and 15]; Colorado River, twenty miles south of Pilot Knob, and at lat. $32^{\circ} 15'$; Alamo River, twenty miles southwest of Pilot Knob; vicinity of Cerro Prieto [including three skins of dates May 30 and June 12]. These latter verified occurrences make it likely that the yellow-throats found by Price (1899, p. 93) in the Colorado delta, "not uncommon" in December, were of the present race.

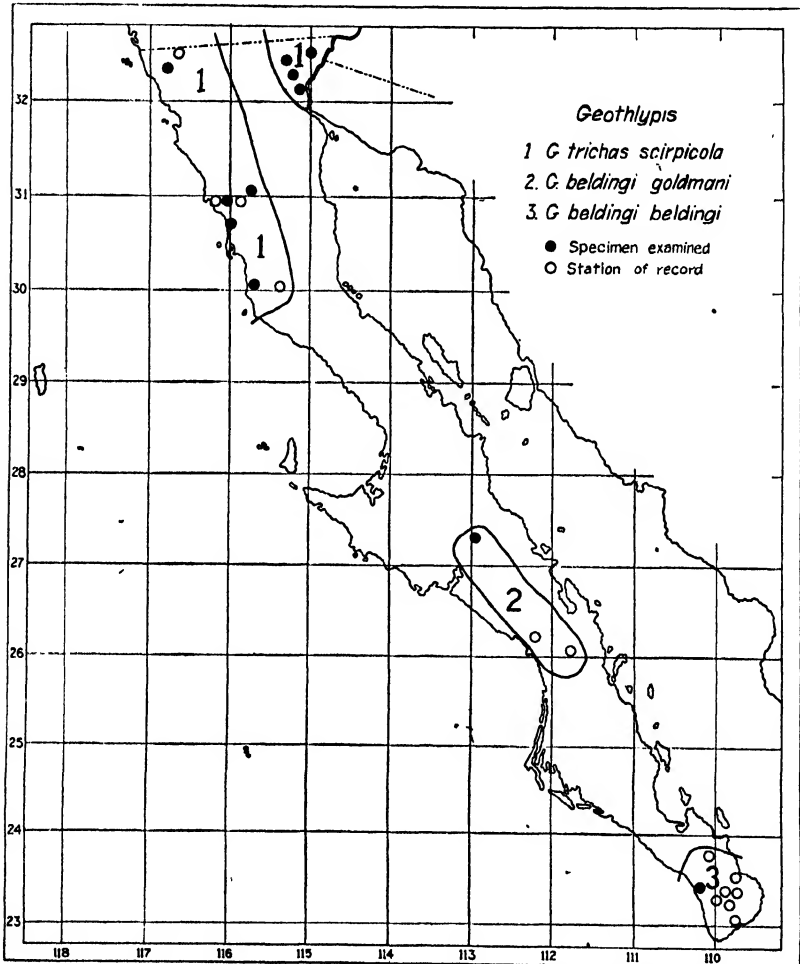


Fig. 17. Breeding ranges of Yellow-throats, genus *Geothlypis*, in Lower California.

***Geothlypis beldingi goldmani* Oberholser**

Goldman Belding Yellow-throat

Common resident locally in a section of the peninsula between latitudes 26° and 28° . Recorded first from this territory by Bryant (1889a, p. 20, under the name *Geothlypis beldingi*), from Comondú, nesting. The subspecies *goldmani*

was newly named by Oberholser (1917*e*, p. 183), with type [no. 196026 in U. S. Nat. Mus.] from San Ignacio, collected by E. W. Nelson and E. A. Goldman, October 7, 1905. Other ascriptions applying here are: lower Purísima Cañon and San Ignacio (Bryant, 1889*b*, p. 311); Comondú (Ridgway, 1902, p. 679, part, and Thayer, 1909*d*, p. 101); San Ignacio (Nelson, 1921, p. 34). Oberholser (1917*e*, p. 184) identifies a Belding Yellow-throat from San José del Cabo, January 21, as a vagrant of *goldmani*. The Museum of Vertebrate Zoology contains a series of *goldmani* from San Ignacio.

***Geothlypis beldingi beldingi* Ridgway**

Cape Belding Yellow-throat

Common resident in the Cape district proper, where belonging to the riparian association at the lower levels. Life-zone, Arid Tropical (Nelson, 1921, pp. 120, 123, 124). First recorded, and the species newly named, by Ridgway (1882*b*, p. 344) from specimens [type is no. 87685 in U. S. Nat. Mus.] taken by Lyman Belding at San José del Cabo. Belding himself (1883*b*, p. 546) records it additionally from Miraflores, Agua Caliente, and the cañons of Miraflores and Santiago peaks. Brewster (1902, pp. 188-190, part) in his full account of the species gives the further localities, Triunfo and Santiago. Specimens are in the Museum of Vertebrate Zoology from Todos Santos. Some notable citations additionally to the above are: Belding, 1900, p. 3, and Fisher, 1920, p. 39 (historical); Bryant, 1891, p. 192 (San José del Cabo); Sharpe, 1885, p. 356 (San José del Cabo); Townsend, 1923, p. 23 (San José del Cabo and Miraflores); Thayer, 1909*b*, p. 142 (Eureka and Santiago); Kaeding, 1905, p. 137 (San José del Cabo); Ridgway, 1902, pp. 656, 679.

***Icteria virens longicauda* Lawrence**

Long-tailed Yellow-breasted Chat

Summer resident, and breeding locally in the riparian association, at the lower levels of the peninsula northward from about latitude 26°. Also occurs in the Cape district in the fall and perhaps sparingly through the winter. Most characteristic of the northwestern section, Pacific drainage. First reported by Baird (1865, p. 230, under the name *Icteria longicauda*) on basis of specimen taken by Xantus at Cape San Lucas, October 10 [1859]. Ascribed to Lower California by Salvin and Godman (1881, p. 159, under *Icteria viridis*), but upon what evidence is not stated. Belding (1883*b*, p. 537) found the species "rare" in the Cape region, but on what dates he found it he does not state. Other, more definite occurrences are: San José del Cabo, September 15 to October 25 (Brewster, 1902, p. 190); Comondú, nesting (Bryant, 1889*b*, p. 312); valleys west from west base of Sierra San Pedro Mártir (Anthony, 1893, p. 245) [specimens in Carnegie Mus., of dates May 2 and July 1]; San Ignacio, April 28, San Fernando, June 3, Valladares, April 17 and 18, and Colorado delta seven miles east of Cerro Prieto, May 26 and June 2 and 13 (specimens in Mus. Vert. Zool.).

***Wilsonia pusilla pileolata* (Pallas)**

Alaska Pileolated Warbler

Rather rare fall and late spring transient, apparently through the entire length of the territory. Verified occurrences are as follows: Sierra San Pedro Mártir, one specimen, May 18, 1893 (in Carnegie Mus., A. W. Anthony coll., as per Anthony, 1893, p. 245, part, under *Sylvania pusilla pileolata*); Sierra de la Laguna, May 4 and 31, 1887 (Brewster, 1902, p. 191, part) [just these two specimens out of the Brewster series I find to be true *pileolata*]; La Grulla, 7200 feet,

Sierra San Pedro Mártir, October 8, 1925, and El Major, in the Colorado delta, April 24, 1926 (specimens in Mus. Vert. Zool.). Townsend (1923, p. 23) records a specimen of *pileolata* taken at sea, north of Guadalupe Island, April 25, 1911.

***Wilsonia pusilla chryseola* Ridgway**

Golden Pileolated Warbler

More or less common in migration the entire length of the peninsula, and a few apparently winter in the Cape district. First reported by Baird (1865, p. 240, under the name *Myiodioctes pusillus*) from specimens taken by Xantus at Agua Escondida near Cape San Lucas in November, 1859, and in the Sierra "San Gertrude" in January, 1861 (see Ridgway, in Belding, 1883b, p. 533, under *Myiodioctes pusillus pileolatus*). Further published records belonging under this heading either certainly or probably are: Comondú, in March (Bryant, 1889b, p. 313, under *Sylvania pusilla pileolata*); La Paz and southward [in winter] (Belding, 1883c, p. 350); La Paz, February 5 and March 21, San José del Cabo, August 25 to October, San José del Rancho in December (Brewster, 1902, p. 191, part, under *Wilsonia pusilla pileolata*) [eighteen of the Brewster specimens I find to be good *chryseola*]; San José del Cabo, September (Bryant, 1891, p. 188); Sierra San Pedro Mártir and valleys to westward, in April and May (Anthony, 1893, p. 245, part); San Fernando, in migration (Anthony, 1895d, p. 142, under *Sylvania pusilla*); Santana, March 19 and 20 (Thayer and Bangs, 1907c, p. 139); San Felipe, April 12 to 23 (Huey, 1927d, p. 35); near Mexicali, April 19 (Murphy, 1917, p. 98). In the Carnegie Museum, A. W. Anthony coll., are verified skins of *chryseola* from: Sierra San Pedro Mártir, May 18 and 21; Valle de las Palmas, April 4 and 5; Tijuana, April 18. In the Museum of Vertebrate Zoology are specimens with following data: San José, 2500 feet, latitude 31°, September 27 and October 21; Valladares, 2700 feet, April 17, 22 and 23; La Grulla, 7200 feet, May 18 and October 3; San Felipe, on the Gulf, April 12 and 16. There is some ground for believing that this warbler breeds in the northwestern section of the territory.

***Setophaga ruticilla* (Linnaeus)**

American Redstart

Occurs in the Cape district in winter, at least of some years; yet not known at all, so far, from the territory to the northward. Instances are as follows: Miraflores, specimen shot February 24, 1883, and La Paz, one "probably seen" in March, 1883 (Belding, 1883c, p. 350); San José del Cabo, several seen in winter of 1923, specimen being taken April 10, and Todos Santos, one seen November 8 (Lamb, 1927b, p. 157).

***Euthlypis lachrymosa tephra* Ridgway**

Western Fan-tailed Warbler

Vagrant. One instance: Santo Domingo, latitude 30° 45', specimen [now no. 47045, Mus. Vert. Zool.] taken by C. C. Lamb, December 31, 1925 (Grinnell and Lamb, 1927, p. 126).

***Motacilla ocularis* Swinhoe**

Swinhoe Wagtail

Far vagrant. One instance: La Paz, specimen, adult, not sexed [now no. 86259 in U. S. Nat. Mus.] taken by Lyman Belding, January 9, 1882 (Ridgway, 1882a, p. 414, and 1883a, p. 146); "found on a drift of sea-weed on the beach"

(Belding, 1883b, p. 535). Mr. J. H. Riley, of the U. S. National Museum, has kindly examined this specimen, which is now mounted on exhibition; he confirms the data and identification as above (*vide* Dr. C. W. Richmond).

***Anthus rubescens* (Tunstall)**

American Pipit

Common and widespread in winter on suitable terrain practically throughout the peninsula, reaching also some of the islands. Reported first by Baird (1864, p. 154, under the name *Anthus ludovicianus*) as having been obtained by Xantus at Cape San Lucas, November 23, 1859. Belding (1883b, p. 546, and 1883c, pp. 347, 350) found the species at San José del Cabo in February and up to May 3, and on the Sierra de la Laguna [in late winter]. Some further published records are: La Paz in February, Loreto March 13, and San José del Cabo beginning October 4 (Brewster, 1902, p. 193, under *Anthus pensilvanicus*); Carmen Island, April 3 (Townsend, 1923, p. 23); Guadalupe Island, February 2 (Bryant, 1887a, p. 307); Pond Lagoon, April 14 (Huey, 1927g, p. 243); Comondú in April, and top of Sierra San Pedro Mártir, May 8 [according to A. W. Anthony] (Bryant, 1889b, p. 313); San Martín Island, March 10 (Kaeding, 1905, p. 137); Santana, March 24 (Thayer and Bangs, 1907c, p. 139); Colorado delta, in December and February (Price, 1899, p. 93, and Stone and Rhoads, 1905, p. 685). Specimens are in the Museum of Vertebrate Zoology as follows: San Ramón, December 10; San José, 2500 feet, October 24; La Grulla, 7200 feet, October 15; El Valle de la Trinidad, 2500 feet, December 2; Laguna Hanson, 5200 feet, October 12.

***Anthus cervinus* (Pallas)**

Red-throated Pipit

Far vagrant. One instance: San José del Cabo, specimen mounted (no. 89799 in U. S. Nat. Mus.) shot by L. Belding "on the bank of an irrigating ditch" January 26, 1883 (Ridgway, 1883c, p. 156, and Belding, 1883c, p. 350). The date "February 7," given by Belding (*loc. cit.*) and quoted by Bryant (1889b, p. 313) was an error (see Brewster, 1902, p. 193, and Nelson, 1921, p. 112). The data and identification as above have been confirmed upon recent examination by Mr. J. H. Riley (*vide* C. W. Richmond).

***Oroscoptes montanus* (J. K. Townsend)**

Sage Thrasher

Fairly common in winter locally south over the whole peninsula, reaching also some of the islands. First reported by Baird (1864, p. 43) as taken by Xantus at Cape San Lucas, November 5 and 11, 1859. Further definite ascriptions are: Cape district, "rare" (Belding, 1883b, p. 534); La Paz, January 27 (Brewster, 1902, p. 194); Guadalupe Island, January 7 (Bryant, 1887a, p. 307); "northwest coast in spring," according to A. W. Anthony (Bryant, 1889b, p. 313); San Bartolomé Bay, March 13 (Townsend, 1923, p. 23); Santana, Rosarito and San Jabier, February 23 to April 1 (Thayer and Bangs, 1907c, p. 137); San Martín Island, March 12 (Kaeding, 1905, p. 137); San Fernando, in January (Anthony, 1895d, p. 142); near San Felipe, March (Huey, 1927d, p. 35); Colorado delta, in December (Price, 1899, p. 93). Specimens are in the Museum of Vertebrate Zoology from: San Telmo, November 26 and 28, March 30 and April 1; San Felipe, March 24 and 25; Las Palmas Cañon, west side Laguna Salada, November 4, 7 and 9; five miles east of Cerro Prieto, February 11.

***Mimus polyglottos leucopterus* (Vigors)**

Western Mockingbird

Variably common as a permanent resident throughout the whole length of the peninsula, and reaching some of the islands. Life-zone, chiefly Lower Sonoran; affects open brush and cactus associations. First recorded by Baird (1859, p. 303, and 1864, p. 50, under the name *Mimus polyglottus*) as taken by Xantus at Cape San Lucas, October 31, 1859. Further distributional data are as follows: Cape San Lucas north to thirty miles north of Todos Santos and to latitude 24° 30' on the Gulf side (Belding, 1883b, p. 534, and 1883c, p. 345); San José del Cabo, Triunfo, and La Paz (Brewster, 1902, p. 194); Guadalupe Island, March 16, 1886 (Bryant, 1887a, p. 308); Santa Margarita Island (Bryant, 1889b, p. 314); San Ignacio Lagoon (Huey, 1927g, p. 240); Santana, San Jabier, and Rosarito (Thayer and Bangs, 1907c, p. 137); Cedros Island (Thayer and Bangs, 1907b, p. 79); Cedros Island, and Colnett (Willett, 1913, p. 24); Espíritu Santo Island (Nelson, 1921, p. 92); Cedros Island, Magdalena Bay, Agua Verde Bay, Mulegé, San Francisquito Bay, and Concepción Bay (Townsend, 1923, p. 23); San Felipe (Huey, 1927d, p. 36); El Valle de la Trinidad (Huey, 1928a, p. 159); Colorado delta (Price, 1899, p. 93, and Stone and Rhoads, 1905, p. 687); near Mexicali, Pattie Basin, and Tres Pozos (Murphy, 1917, p. 98). Specimens are in the Museum of Vertebrate Zoology from the following localities: San Ignacio; San Telmo; El Valle de la Trinidad; Los Pozos, Sierra Juárez (October 28); El Cajón Cañon, at east base of Sierra San Pedro Mártir; San Felipe, on the Gulf; Las Palmas Cañon, west side Laguna Salada; Valle de las Palmas; five miles south of Monument 258, at United States boundary.

***Toxostoma cinereum mearnsi* (Anthony)**

Mearns San Lucas Thrasher

Fairly common resident at the north along the west side of the peninsula between about latitudes 31° and 28° 30'. Life-zone, Lower Sonoran; lives among far-spaced bushes and cactus clumps. Thrashers of this species were first reported from within the range of the present subspecies by Bryant (1889b, p. 314, under the name *Harporhynchus cinereus*) from San Quintín and southward. The subspecies was newly described by Anthony (1895a, p. 53, under the name *Harporhynchus cinereus mearnsi*), with type [now no. 18828 in Carnegie Mus.] taken by himself at San Quintín, January 2, 1894; San Fernando, San Carlos Mesa and other localities given. Further records of importance are: San Quintín (Anthony, 1891, p. 381); San Quintín and to the eastward toward the Sierra San Pedro Mártir to "over three thousand feet" altitude (Howell, 1911, p. 153); vicinity of San Antonio del Mar [lat. 31° 7', northernmost station of occurrence] south to Santa Catarina Landing (Huey, 1926, p. 359); inland from Santa Rosalía Bay (Anthony, 1897b, p. 167); Rosario, San Jabier, and Santana [series from last two localities show approach to *cinereum*] (Thayer and Bangs, 1907c, p. 138). In the Museum of Vertebrate Zoology is a good series of *mearnsi* from San Telmo, and one specimen from near the shore of Santa Rosalía Bay that is nearly intermediate between *mearnsi* and *cinereum*, though I have cataloged it under the former name.

***Toxostoma cinereum cinereum* (Xantus)**

Cape San Lucas Thrasher

Common resident at the lower altitudes throughout the southern half of the peninsula; at the north intergrades with the subspecies *mearnsi* from along about

latitude 28° to $29^{\circ} 30'$. Life-zones, Arid Tropical and Lower Sonoran; inhabits an open type of brushland, with cactus, mesquite, etc. Originally described by Xantus (1859, p. 298, under the name *Harporhynchus cinereus*) as taken by himself at Cape San Lucas in May, 1859 [type is no. 12957 in U. S. Nat. Mus.]. Important references subsequently published are: Baird, 1864, p. 46; Baird, Brewer and Ridgway, 1874, I, p. 40; Ridgway, 1907, p. 195; Belding, 1883b,

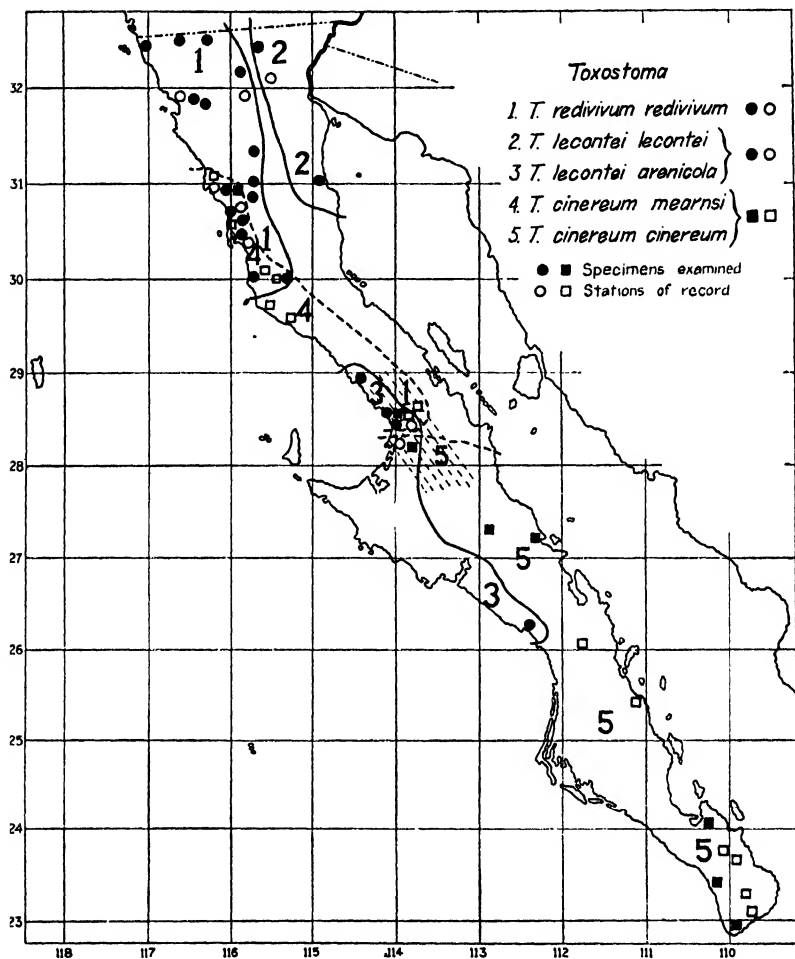


Fig. 18. Distribution of certain Thrashers, genus *Toxostoma*, in Lower California. Intergradation between races shown by shading.

p. 534, under *Methriopterus cinereus*, and 1883c, p. 345 (Cape region north to thirty miles north of Todos Santos and to $24^{\circ} 30'$ on the Gulf side); Brewster, 1902, p. 195 (La Paz, Triunfo, San José del Rancho, and San José del Cabo); Bryant, 1889b, p. 314, part (Comondú and northward); Townsend, 1923, p. 24 (Miraflores, and Agua Verde Bay); Kaeding, 1905, p. 137, using the name *Toxostoma cinereum mearnsi* (San Juanico Bay). Specimens of *cinereum* are in the

Museum of Vertebrate Zoology as follows: Cape San Lucas (taken by John Xantus, April 26, 1860); La Paz; Todos Santos; San Ignacio; San Lucas (lat. 27° 15'); Rancho Mesquital, thirty-three miles west of Calmallí (lat. 28° 15').

***Toxostoma redivivum redivivum* (Gambel)**

Southern California Thrasher

Common resident in the northwestern section of the territory, altogether on the Pacific drainage, and from about latitude 30° to the United States boundary. Restricted rather closely to the Upper Sonoran life-zone (entering the Lower Sonoran locally) and to a heavy type of chaparral. Reported first by Belding (1883a, p. 528, under the name *Harporhynchus redivivus*) from San Quintín Bay. A supposed subspecies, *Toxostoma rediviva helva*, was named by Thayer and Bangs (1907a, p. 17) with type [no. 6000, Thayer coll., taken by W. W. Brown, Jr., November 19, 1906] from El Rosario, latitude 30°, the southernmost known station for the species. But despite the strong assertions of Oberholser (1918a, p. 61) I find myself unable to distinguish such a race in comparison with a considerable topotype series of *redivivum* from Monterey, Upper California. Ridgway (1907, p. 888), probably by error, uses the name *Toxostoma redivivum helvolum* for the supposed Lower California race. Further notable ascriptions are: El Valle de la Trinidad, Sierra San Pedro Mártir, El Rosario, and San Quintín (Bryant, 1889b, p. 314); Sierra San Pedro Mártir up to 7000 [?] feet altitude (Anthony, 1893, p. 245); San Fernando and El Rosario (Anthony, 1895d, p. 142); Colnett (Willett, 1913, p. 24); Laguna Hanson, Ensenada, Santo Domingo, San Simón, etc. (Oberholser, 1918a, pp. 52-61); San Fernando, and El Rosario (Huey, 1926, p. 359); San Telmo (Baneroff, 1926, p. 212). The series in the Museum of Vertebrate Zoology is representative of the following localities, beginning at the north: Nachoguero Valley, 3400 feet; Tecate; five miles south of Monument 258; Los Pozos, 4200 feet; Las Cruces; Rancho Ojos Negros; El Valle de la Trinidad; San José, 2500 feet; Valladares, 2700 feet; San Telmo; San Ramón; Arroyo Nuevo York, 15 miles south of Santo Domingo; San Fernando; El Rosario.

***Toxostoma lecontei lecontei* Lawrence**

Gila Leconte Thrasher

Common resident locally at the northeast, on the Colorado Desert. Life-zone, Lower Sonoran; affects level sandy-surfaced desert, sparsely vegetated. Recorded first for Lower California, definitely, in the third edition of the A. O. U. Checklist (1910, p. 334): "south to San Felipe Bay." Murphy (1917, p. 99) reports it from Pattie Basin, and Nelson (1921, p. 126) from the "Colorado Desert district." Huey (1927d, p. 36) records it from San Felipe, on the Gulf, nesting. The Museum of Vertebrate Zoology contains series of specimens from the vicinity of San Felipe, and, to the northward, from the west side of Laguna Salada at the mouth of Las Palmas Cañon.

***Toxostoma lecontei arenicola* (Anthony)**

Santa Rosalía Leconte Thrasher

Fairly common resident in a narrow coastal strip along the western side of the peninsula between latitudes 26° and 29°. Life-zone, Lower Sonoran, within which apparently restricted to areas of sand dunes, or at least to sandy-surfaced terrain. First recorded, and the subspecies newly named, by Anthony (1897b, p. 167, under the name *Harporhynchus lecontei arenicola*), with type [now no. 18914 in Carnegie Mus.] from Santa Rosalía Bay, taken by himself August 20,

1896; reported also from Playa María Bay. Nelson (1921, p. 30) records it from near Santo Domingo Landing [lat. 28° 15']. Kaeding (1905, p. 137) records it from Playa María Bay and also from San Juanico Bay [near lat. 26°, the southernmost known station for the species; I have examined the specimens from those localities, now in the Carnegie Museum]. Thayer and Bangs (1907c, p. 138) record specimens from San Jabier, a little ways inland from the type locality. The Museum of Vertebrate Zoology contains specimens from the same general vicinity.

***Toxostoma crissale crissale* Henry**

Arizona Crissal Thrasher

Fairly common resident in the extreme northeastern corner of the territory, in the northern portion of the Colorado desert. Life-zone, Lower Sonoran. First ascription: foothill chaparral "above high-water mark" at east base of Cocopah Mountains (Stone and Rhoads, 1905, p. 686). Other definitely reported localities of occurrence are: Seven Wells, and Gardners Laguna, Salton River [near Mexicali] (Ridgway, 1907, p. 208, part). The Museum of Vertebrate Zoology contains a small series of specimens taken in the mesquite association at the mouth of Las Palmas Cañon, west side of Laguna Salada, and other specimens from the Alamo River, twenty miles southwest of Pilot Knob, and from seven miles east of Cerro Prieto.

***Toxostoma crissale trinitatis* Grinnell**

Trinidad Crissal Thrasher

Common resident in the small area comprised in El Valle de la Trinidad, about 2500 feet altitude, latitude 31° 20'. First found there by Lyman Belding in May, 1885 (see Bryant, 1889b, p. 314, under the name *Harporyhynchus crissalis*). It is possible that Belding also told Ridgway of this discovery, as the latter (1887a, p. 546) credits this thrasher to "northern Lower California" and is chronologically the first to have done so. Ridgway (1907, p. 208, part) definitely cites the locality "Trinidad Valley." Anthony (1893, p. 245) thought he saw this species of thrasher high on the Sierra San Pedro Mártir; very doubtful. The subspecies *trinitatis* was described by Grinnell (1927d, p. 127), with type [no. 50273, Mus. Vert. Zool.] taken by C. C. Lamb, November 15, 1926, in El Valle de la Trinidad, whence the Museum of Vertebrate Zoology has a small series of specimens.

***Heleodytes brunneicapillus couesi* (Sharpe)**

Northern Cactus Wren

Common resident of the Colorado Desert district, south at least to latitude 30° 50'; west to El Valle de la Trinidad, and, just south of the United States boundary, to within twenty miles of Tijuana. Life-zone, Lower Sonoran; mesquite and cactus associations, as a rule. Cactus Wrens were first recorded from this area by Price (1899, p. 93, under the name *Heleodytes brunneicapillus*) who found them along the lower Colorado River. The next ascription is that of Mearns (1902b, p. 143, under the name *Heleodytes brunneicapillus anthonyi*). Further definite records are: Seven Wells (Ridgway, 1904, p. 523); Hardy River and east base of Cocopah Mountains (Stone and Rhoads, 1905, p. 686); Pattie Basin, Tres Pozos, and near Mexicali (Murphy, 1917, p. 99); Don Lorenzo, southeast of Mexicali (Bancroft, 1922, p. 98); 20 miles east of Tijuana (Bancroft, 1923, p. 166); San Felipe, on the Gulf (Huey, 1927d, p. 36). Specimens of the present subspecies are in the Museum of Vertebrate Zoology from: Alamo River, twenty miles southwest of Pilot Knob; five and seven miles east of Cerro Prieto; Colorado River at latitude 32° 15'; thirteen miles north of El Major; Las Palmas Cañon,

west side Laguna Salada; San Felipe, on the Gulf; mouth of El Cajón Cañon, east base of Sierra San Pedro Mártir; El Valle de la Trinidad, 2500 feet, at north end of Sierra San Pedro Mártir. Specimens from the latter locality, curiously, show no tendency toward the race *bryanti*.

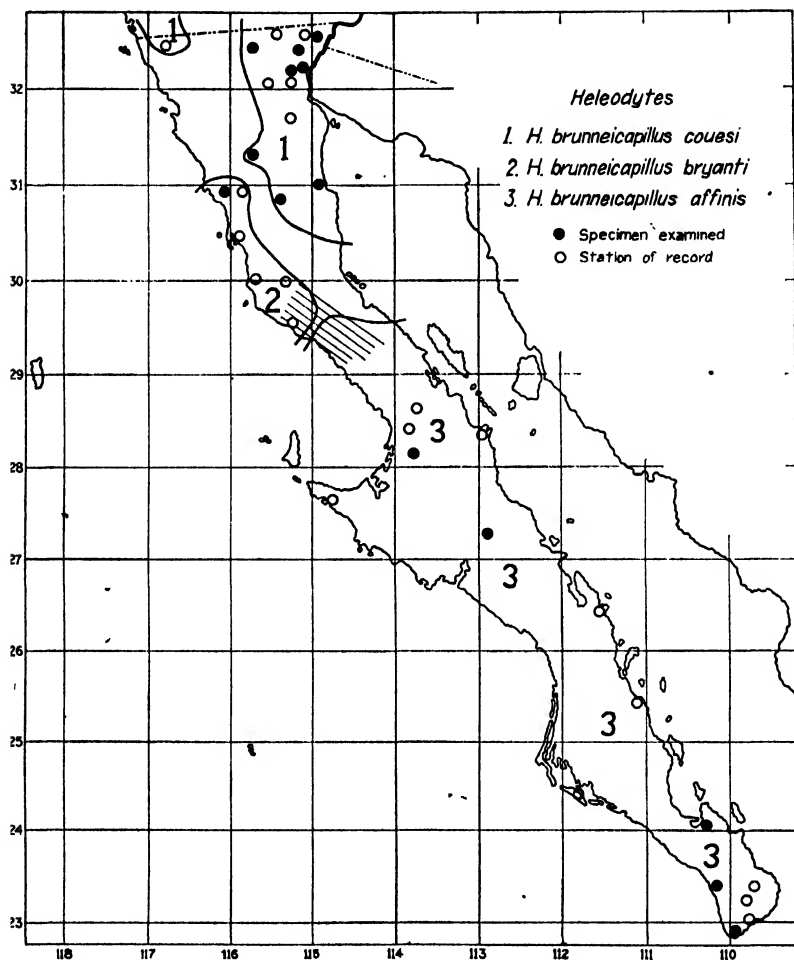


Fig. 19. Distribution of Cactus Wrens, genus *Heleodytes*, in Lower California. Intergradation between races shown by shading.

***Heleodytes brunneicapillus bryanti* Anthony**

Bryant Cactus Wren

Common resident locally in the San Quintín district; roughly, from latitude 31° south to latitude 29° 30', and altogether on the lower Pacific drainage. Life-zone, Lower Sonoran; cactus association. First reported, this subspecies, as later developed, by Bryant (1889b, p. 315, under the name *Campylorhynchus brunneicapillus*) from west side of Sierra San Pedro Mártir "up to 1,500 feet altitude"

according to A. W. Anthony. Anthony (1893, p. 245, under *Campylorhynchus affinis*) recorded the species from San Telmo, and from there he took the type [collected April 30, 1893, now no. 17789 in Carnegie Mus.] of his new subspecies *bryanti* (Anthony, 1894a, p. 212), recording specimens also from "San Quintín to San Fernando." Further references are as follows: Anthony, 1895d, p. 142 (San Fernando); Mearns, 1902b, p. 143, part; Ridgway, 1904, p. 519, part, and p. 520, under *Heleodytes brunneicapillus affinis* in part [localities badly mixed!]; Grinnell, 1921, p. 169; Bancroft, 1923, pp. 165-167 (San Telmo, San Quintín, El Rosario, and south to Santa Catarina Landing—does not integrate at the north with *couesi*); Huey, 1926, p. 360 (twenty miles east of San Telmo, and Santa Catarina Landing [lat. 29° 30']). The Museum of Vertebrate Zoology has a good series of this race of Cactus Wren from San Telmo.

***Heleodytes brunneicapillus affinis* (Xantus)**

San Lucas Cactus Wren

Common resident of the southern two-thirds of the peninsula, occurring north (this subspecies) at least to latitude 29°. Occupies the Arid Tropical and Lower Sonoran life-zones; affects the fan palm, mesquite and cactus associations. Reported first, and newly described, by Xantus (1859, p. 298, under the name *Campylorhynchus affinis*) as taken by himself at Cape San Lucas (see Baird, 1864, p. 100); type is no. 12965 in U. S. Nat. Mus., collected in May, 1859 [*vide* C. W. Richmond, MS]. Subsequent published records of note are: La Paz, as collected by A. Forrer (Sharpe, 1881, pp. 197-198, under the name *Campylorhynchus brunneicapillus*); Cape region generally (Belding, 1883b, p. 535, and 1883c, p. 345); eggs (Norris, 1886, p. 20); central parts of the peninsula (Bryant, 1889b, p. 315); critical (Anthony, 1894a, p. 210, under *Heleodytes affinis*); San José del Cabo, and Santiago (Brewster, 1902, p. 197); San José del Cabo (Kaeding, 1905, p. 137); La Paz, etc. (Ridgway, 1904, p. 520, part); Turtle Day (Kaeding, 1905, p. 137, under *Heleodytes brunneicapillus bryanti*); Santana, and San Jabier (Thayer and Bangs, 1907c, p. 138); San Ignacio (A. O. U. Comm., 1910, p. 335, under *H. b. bryanti* in part); Santa Margarita Island (Nelson, 1921, p. 90); Cape San Lucas, Miraflores, Agua Verde Bay, etc. (Townsend, 1890, p. 136, and 1923, p. 24); San Francisquito Bay, and Point Santa Antonita (Mailliard, 1923, pp. 451, 455). Specimens of *affinis* are in the Museum of Vertebrate Zoology as follows: La Paz; Cape San Lucas (collected by John Xantus, April, 1860); Todos Santos; San Ignacio; San Lucas (on the Gulf); Calmallí (thirty-three miles west of).

***Salpinctes obsoletus obsoletus* (Say)**

Northern Rock Wren

Varyingly common resident the entire length of the peninsula; reaches practically all of the islands except Guadalupe, where replaced by another race. Occurs in all life-zones, but restricted locally to rocky places. Reported first by Baird (1864, p. 110) as having been taken by Xantus at Cape San Lucas in January, 1860. Some further published ascriptions are: Cape San Lucas (Salvin and Godman, 1880, p. 71); Cape region generally (Belding, 1883b, p. 535); La Paz (Brewster, 1902, p. 199); La Paz, and Todos Santos (Lamb, 1927b, p. 157); San Luís Islands (Bancroft, 1927b, p. 195); Ildefonso Island (Thayer, 1911b, p. 106, and Lamb, 1924, p. 63); Cedros and the San Benito islands (Kaeding, 1905, p. 137, Thayer and Bangs, 1907b, pp. 79, 81, and Swarth, 1914, p. 214); Santa Margarita, Magdalena and San Martín islands and toward top of Sierra San Pedro Mártir (Bryant, 1889b, p. 315); Santa Margarita, Cerralvo and Espíritu

Santo islands (Nelson, 1921, pp. 90-92); Magdalena Bay, and San Benito Islands (Townsend, 1923, p. 24); Santana (Thayer and Bangs, 1907c, p. 138); San Fernando (Anthony, 1895d, p. 143); San Martín Island (Kaeding, *loc. cit.*, Willett, 1913, p. 24, Wright, 1913, p. 210, and McLellan, 1926, p. 314); Todos Santos Islands (Howell, 1912, p. 191, and Van Denburgh, 1924, p. 71); Los Coronados Islands (Grinnell and Daggett, 1903, p. 33, Wright, 1909, p. 100,

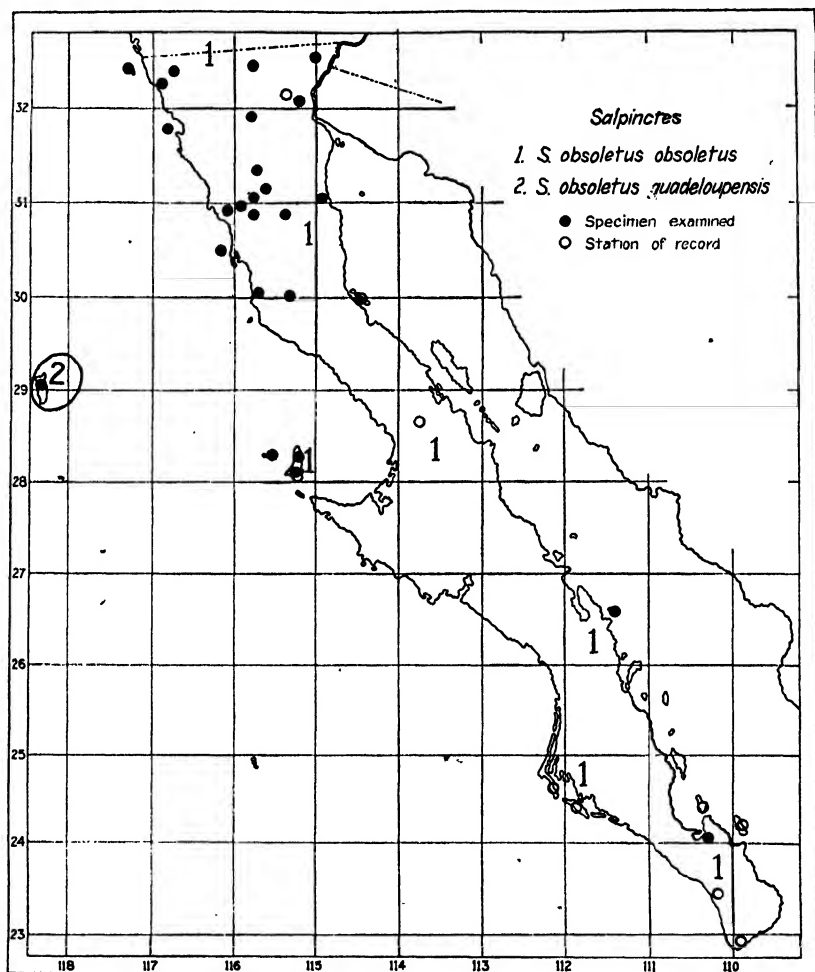


Fig. 20. Distribution of Rock Wrens, genus *Salpinctes*, in Lower California.

Osburn, 1909, p. 138, Howell, 1917, p. 95, and Stephens, 1921, p. 97); at sea off west coast of Lower California (Anthony, 1897a, p. 57); San Felipe (Huey, 1927d, p. 36); Cocopah Mountains, and Colorado River near United States boundary (Stone and Rhoads, 1905, p. 686). A supposed new subspecies was described by Swarth (1914, p. 215, under the name *Salpinctes guadeloupensis proximus*), with type [now no. 27079 in Mus. Vert. Zool.] taken by George Willett on San Martín Island, April 10, 1912; but subsequently gathered material

disproves its tenability (see Grinnell, 1928b, p. 155). Specimens of the subspecies *obsoletus* are contained in the Museum of Vertebrate Zoology as follows: Los Coronados Islands; seacoast fifteen miles south of Descanso Bay; south end of Valle de las Palmas, 1200 feet; San Martín Island; Cedros Island; San Telmo, and ten miles east of San Telmo; San José, 2500 feet; near Concepción, 6000 feet, Sierra San Pedro Mártir; El Valle de la Trinidad; Laguna Hanson, 5200 feet, Sierra Juárez; El Cajón Cañon, east base Sierra San Pedro Mártir; San Felipe Bay; El Major, west side of Colorado delta; Las Palmas Cañon, west side Laguna Salada; Colorado River, twenty miles south Pilot Knob.

***Salpinctes obsoletus guadeloupensis* Ridgway**

Guadalupe Rock Wren

Abundant resident on Guadalupe Island. First reported, and the form newly named, by Ridgway (1876b, p. 185) on the basis of specimens obtained by Edward Palmer in 1875; the type is no. 70045 in U. S. Nat. Mus., taken February 24 [*vide* C. W. Richmond, MS]. Ridgway (1877, p. 61, under the name *Salpinctes guadeloupensis* [*sic*]) and others for a time thought that full specific status for this wren was in order; but the latest consensus is that intergradation through individual variation brings overlapping, of all characters, with *obsoletus*. Notable references concerning this wren are as follows: Sharpe, 1881, p. 268; Ridgway, 1887a, p. 548; Bryant, 1887a, p. 308 (full account); Townsend, 1890, p. 138; Lucas, 1891, p. 221 (skeleton); Gaylord, 1897a, p. 42; Thoburn, 1899, p. 278; Ridgway, 1904, p. 650; Kaeding, 1905, p. 137; Thayer and Bangs, 1908, p. 105; Miller, 1919, p. 295 (status systematically); Oberholser, 1919f, p. 407 (variability); Townsend, 1923, p. 24; Huey, 1924b, p. 580; McLellan, 1926, p. 314 (evidently still common up to April, 1925). Specimens of this wren are in the Museum of Vertebrate Zoology, taken by (or for) A. W. Anthony, September 21, 1896, and March 23, 1897, and by H. A. Gaylord, September 21, 1896.

***Catherpes mexicanus punctulatus* Ridgway**

Dotted Cañon Wren

Fairly common resident here and there the entire length of the territory, except in the Colorado desert district at the extreme northeast. Shows preference for mountainous areas chiefly within the Upper Sonoran and Transition life-zones. First reported by Belding (1883b, p. 535, and 1883c, p. 347, under the name *Catherpes mexicanus conspersus*) from the Victoria Mountains in the Cape district. Further published ascriptions of note are: Comondú, San Sebastián [lat. 28° 30'], and Sierra San Pedro Mártir (Bryant, 1889b, p. 315); Sierra de la Laguna (Browster, 1902, p. 200); Cape district [critical] (Ridgway, 1904, pp. 661-662); Espiritu Santo Island (Townsend, 1923, p. 24, under the name *Catherpes mexicanus polioptilus* [see Oberholser, 1903a, p. 197]); Victoria Mountains, sea cliffs south of La Paz, and Espiritu Santo Island (Lamb, 1927b, p. 157); Ildefonso Island (Lamb, 1924, p. 63); San Fernando (Anthony, 1895d, p. 143); Sierra San Pedro Mártir (Anthony, 1893, p. 245); Los Coronados Islands, specimen taken March 29, 1909 (van Rossem, 1909, p. 208, and Howell, 1917, p. 96) [now no. 10848, Dickey coll.]. Kaeding's (1905, p. 137) record from Todos Santos Islands looks to me doubtful. The series of skins in the Museum of Vertebrate Zoology represents localities as follows: Laguna Hanson, 5200 feet, Sierra Juárez; San José, 2500 feet, lat. 31°; in Sierra San Pedro Mártir: Concepción, 6000 feet, La Grulla, 7200 feet, and near Vallecitos at 7500 feet; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir; San Ignacio.

Because of the great amount of seemingly uncorrelated variation in the rather small number of cañon wrens as yet available from the chief differentiation centers in Lower California, I am unable satisfactorily to define more than the one race from within the general territory south of the Colorado desert.

***Catherpes mexicanus conspersus* Ridgway**

Nevada Cañon Wren

Presumably resident in the northeastern corner of the territory, in cañons along the western margin of the Colorado Desert. The only definite basis now known for the inclusion of the present subspecies in the avifauna of Lower California consists of three specimens in the Museum of Vertebrate Zoology taken by C. C. Lamb and J. E. Green in Las Palmas Cañon, 200 feet altitude, west side of Laguna Salada, November 2, 3 and 9, 1927.

***Thryomanes bewickii charienturus* Oberholser**

Sooty Bewick Wren

Common resident of the northwestern section of the territory, from the vicinity of the United States boundary south nearly to latitude 30°, occurring chiefly on the Pacific slope but straggling to the east base of the Sierra San Pedro Mártir. Life-zone, characteristically Upper Sonoran; associations, chaparral and live oak. Bewick Wrens were reported first from within the range of the present race by Belding (1883a, p. 528, under the name *Thryomanes bewickii spilurus*) from San Quintín Bay. The subspecies was newly named by Oberholser (1898, p. 435) with type [no. 134163 in U. S. Nat. Mus.] from Nachoguero Valley [just south of the United States boundary, near Jacumba, upper California], taken by Edgar A. Mearns, June 5, 1894 [see also Ridgway, 1904, p. 561, and Oberholser, 1920a, p. 21]. With the (mistaken) idea that the name *charienturus* was applicable to the race of the San Diegan subfaunal district, Grinnell (1927a, p. 72) re-named the present subspecies *Thryomanes bewickii carbonarius*, basing his description on a type [no. 46449 in Mus. Vert. Zool.] from San José, 2500 feet, latitude 31°, taken by himself, October 17, 1925. It turns out that the midline of the belt of intergradation between the San Pedro Mártir race and the San Diegan subspecies falls somewhere a little north of the type locality of *charienturus* (see Grinnell, 1928b, p. 154). Further published ascriptions are: "northwest coast" under 2500 feet (Bryant, 1889b, p. 316, under *Thryothorus bewickii spilurus*); western slopes of Sierra San Pedro Mártir (Anthony, 1893, p. 245); San Quintín Bay (Oberholser, 1898, p. 436, and 1920a, p. 21, and Ridgway, 1904, p. 561); San Quintín (McLellan, 1926, p. 316). The series of specimens in the Museum of Vertebrate Zoology represents the following localities: Nachoguero Valley, 3400 feet; south end of Valle de las Palmas, 1200 feet; five miles south of Monument 258; Los Pozos, 4200 feet, and Laguna Hanson, 5200 feet, in the Sierra Juárez; El Valle de la Trinidad, 2500 feet; Rancho Ojos Negros, 2200 feet; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir; San José, 2500 feet; San Telmo; Colnett; San Ramón; Colorado River at latitude 32° 15' (March 2, 1928, evidently a vagrant).

***Thryomanes bewickii cerroensis* (Anthony)**

Cedros Bewick Wren

Fairly common resident locally in the north-middle section of the peninsula (Vizcaino district) from about 30° latitude south to near 25°; also on Cedros Island. First recorded by Belding (1883a, p. 531, under the name *Thryomanes*

bewicki spilurus) from Cedros Island. Originally named by Anthony (1897b, p. 166, under the name *Thryothorus cerroensis*), with type [now no. 17902 in Carnegie Mus.] from Cerros [=Cedros] Island, taken by himself, September 3, 1896. Further published records are: Cedros Island (Bryant, 1886, p. 64, under *Thryothorus bewickii spilurus*); Soledad Stock Ranch [25° 15', the southernmost known station for the species] (Bryant, 1889b, p. 316); Cedros Island (Town-

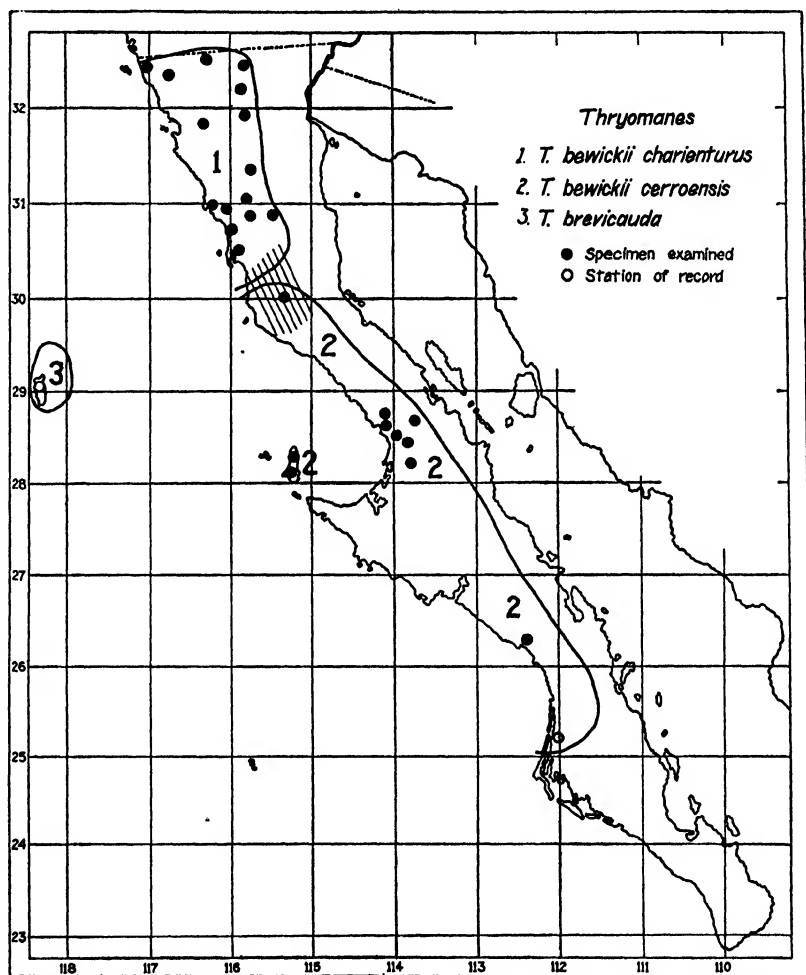


Fig. 21. Distribution of Bewick Wrens, genus *Thryomanes*, in Lower California. Intergradation between races shown by shading.

send, 1890, p. 138, under *Thryothorus bewickii bairdi*); San Fernando [specimens in Carnegie Museum from this place are intermediate toward *charienturus*] (Anthony, 1895d, p. 143); Santa Rosalia Bay (Anthony, 1897b, p. 167); San Juanico Bay (Kaeding, 1905, p. 137); Cedros Island (Oberholser, 1898, p. 445, and 1920a, p. 21, Ridgway, 1904, p. 562, Thayer and Bangs, 1907b, p. 79, and Townsend, 1923, p. 24); San Andrés, San Jabier, Rosarito, and Santana (Thayer

and Bangs, 1907c, p. 138); Cedros Island (McLellan, 1926, p. 316, under *Thryomanes bewicki charienturus*). Specimens are in the Museum of Vertebrate Zoology from: Rancho Mesquital, thirty-three miles west of Calmallí; Cedros Island.

***Thryomanes brevicauda* Ridgway**

Guadalupe Bewick Wren

Restricted to Guadalupe Island where resident formerly in limited numbers among the pines on the higher portions of the island. Now doubtless extinct. First reported, and the species newly named, by Ridgway (1876b, p. 186) on the basis of two specimens obtained by Edward Palmer in 1875; the type is no. 70042 in U. S. Nat. Mus., taken March 2, 1875 (*fid*e C. W. Richmond). Next reported by Bryant (1887a, p. 312, under the name *Thryothorus brevicaudus*), who, in 1886, found the birds already lessening in number, and who collected seven specimens (all, so far as I know, destroyed in the San Francisco fire). The last time any of the species were definitely found alive was the last week in May, 1892, when A. W. Anthony (1901, p. 73) and C. P. Streater obtained three specimens. Extinction was evidently brought about by the destruction of the essential vegetational cover by the introduced goats. Further references of any significance are: Ridgway, 1877, pp. 60-66 (phylogeny); Sharpe, 1881, p. 227; Oberholser, 1898, p. 448 (systematic); Ridgway, 1904, p. 567; Kaeding, 1905, p. 137 (said to have been "seen" March 22, 1897, but in view of Anthony's [1901, p. 73] statement to the contrary this must be doubted); Thayer and Bangs, 1908, p. 106; Oberholser, 1920a, p. 28; Nelson, 1921, p. 95.

***Troglodytes aëdon parkmanii* Audubon**

Western House Wren

Common summer resident at the higher altitudes in the northwestern section of the territory, in the Upper Sonoran and Transition life-zones north of about latitude 30°. In varying numbers elsewhere practically throughout the peninsula, in either transient or winter-visitant status, and reaching some of the islands. Reported first by Baird (1864, p. 140, under the name *Troglodytes parkmanni*) as having been obtained by Xantus at San José [del Cabo], December 5, 1859. Subsequent published records of note are: Cedros Island in April, and Cape district in winter (Belding, 1883a, p. 531, and 1883b, p. 535); Sierra San Pedro Mártir "in the pines" [in May] (Anthony, 1893, p. 245, under *Troglodytes aëdon astecus*); La Paz [in winter] (Bryant, 1889b, p. 316); San José del Cabo, September 29 and October 17, Triunfo, December 9, and San José del Rancho, December 20 and 21 (Brewster, 1902, p. 201); San Benito Islands, March 27 (Kaeding, 1905, p. 137); "Mount Major" [=El Major], in Colorado delta, in February (Stone and Rhoads, 1905, p. 686). Specimens are in the Museum of Vertebrate Zoology, of following data: neighborhood of Vallecitos, 7500 to 8500 feet, Sierra San Pedro Mártir, June 5 to 23; La Grulla, 7200 feet, May 12 and October 9; San José, 2500 feet, May 5 and October 25; El Valle de la Trinidad, 2500 feet, November 22; five miles south of Monument 258, December 31; San Felipe, on the Gulf, April 12; Colorado River, twenty miles south of Pilot Knob, October 17 and 21; Álamo River, twenty miles southwest of Pilot Knob, January 24.

***Telmatodytes palustris paludicola* (Baird)**

Tule Marsh Wren

Sparingly winter visitant south to the Cape district. Records are as follows: San José del Cabo, "rare" in spring (Belding, 1883b, p. 546, and Ridgway,

1904, p. 496); San José del Cabo (Brewster, 1902, p. 202, in part under *Cistothorus palustris paludicola*) [of Brewster's twenty Marsh Wrens only four I find to be seemingly good *paludicola*, all from San José del Cabo, of dates October 3, 11 and 19]; mouth of Hardy River, Colorado delta, in February [2 and 14], two specimens (Stone and Rhoads, 1905, p. 686) [I have examined these and confirmed their identification, provisionally, as *paludicola*; they are not *plesius*].

***Telmatodytes palustris plesius* (Oberholser)**

Western Marsh Wren

Varyingly common as a transient or winter visitant south throughout the entire length of the territory. Restricted to the lower altitudes where brackish or fresh-water marshes are to be found. First reported, certainly this subspecies, by Oberholser (1897a, p. 193, under the name *Cistothorus palustris plesius*) from Miraflores. Brewster (1902, pp. 201-202) records Marsh Wrens from the Cape district under both this name and *Cistothorus palustris paludicola*; I have examined his series and find some skins marked with the latter name also to be *plesius*. The localities given by Brewster are: San José del Cabo, in autumn [seen as early as September 14], Santiago, November 22, and San José del Rancho in December. Other published ascriptions probably or certainly belonging here are: Santa Margarita Island, March 7 (Bryant, 1889b, p. 316); Miraflores and San José del Cabo (Ridgway, 1904, p. 494); San Francisquito Bay, April 10 (Townsend, 1923, p. 24); marshes at head of Gulf of California, in December (Price, 1899, p. 93); Hardy River, in Colorado delta, in February (Stone and Rhoads, 1905, p. 686) [skin taken February 14 examined by me]; Hecheira, southeast of Mexicali, in January (Bancroft, 1922, p. 98). Specimens of good *plesius* are in the Museum of Vertebrate Zoology as follows: Colorado River, twenty miles south Pilot Knob, October 12 to 16; Colorado River at latitude 32° 15', March 2; five miles east of Cerro Prieto, February 11; Nachoguero Valley, 3400 feet, November 26; south end of Valle de las Palmas, 1200 feet, January 13; Laguna Hanson, 5200 feet, October 13; El Valle de la Trinidad, 2500 feet, November 19 and 20, and December 17; San José, 2500 feet, October 22; San Telmo, November 30; Colnett, October 28; San Ramón, December 10; San Quintín, December 18. There is a skin in the collection of the San Diego Society of Natural History from Santa Catarina Landing, of date April 13.

***Telmatodytes palustris aestuarinus* Swarth**

Suisun Marsh Wren

Common locally in the Colorado delta, where apparently resident in swampy places. A series of specimens is contained in the Museum of Vertebrate Zoology, from the Colorado River at latitude 32° 15', taken February 29 and March 1, 1928, and from five and seven miles east of Cerro Prieto, taken February 4 to 13, and May 24 to June 12, 1928. The collector, C. C. Lamb, states (MS) that every evidence indicated breeding in those localities. I am unable satisfactorily to distinguish these specimens from skins of *aestuarinus* from central upper California; they are large and dark colored in comparison with *paludicola* and *plesius*.

***Sitta carolinensis aculeata* Cassin**

Slender-billed White-breasted Nuthatch

Known only from the Sierra Juárez, whence a small series of specimens is available in the Museum of Vertebrate Zoology from the vicinity of Laguna Hanson, obtained by C. C. Lamb, October 7 to 20, 1926. Not reported previously.

Sitta carolinensis alexandrae Grinnell

San Pedro Mártir White-breasted Nuthatch

Fairly common resident on the Sierra San Pedro Mártir, where restricted to the pine belt, Transition and Canadian life-zones. Reported first by Bryant (1889b, p. 316, under the name *Sitta carolinensis aculeata*) as having been found

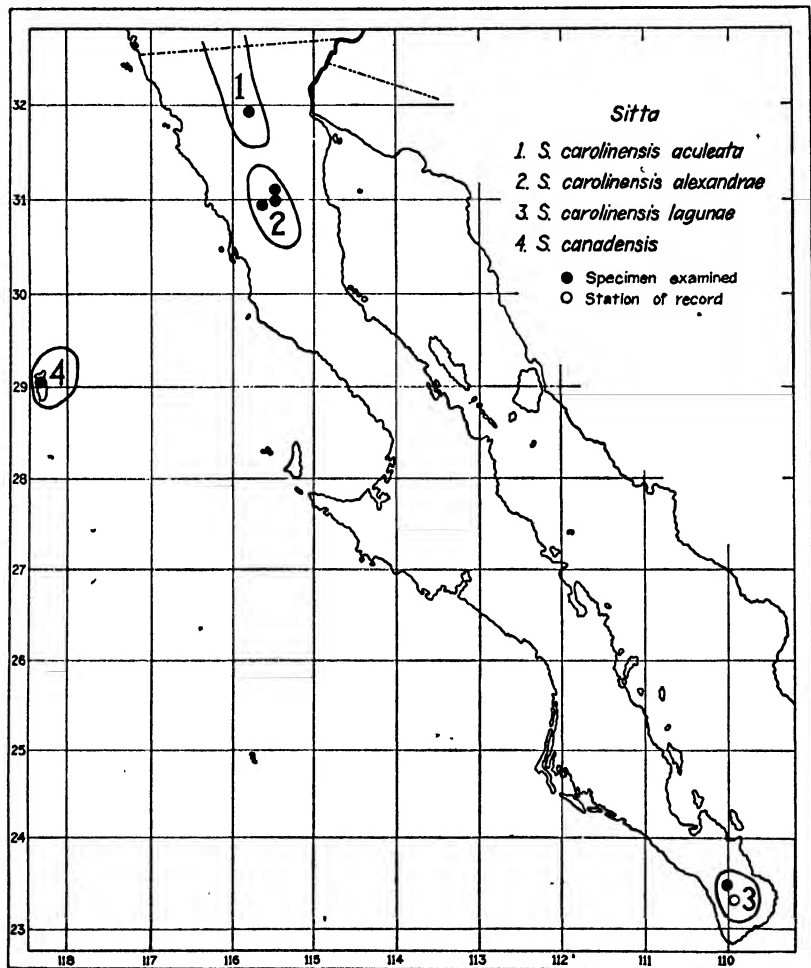


Fig. 22. Distribution of White-breasted and Red-breasted Nuthatches, part of genus *Sitta*, in Lower California.

by A. W. Anthony "nesting from 7,500 to 10,000 feet altitude" on the San Pedro Mártirs. Anthony himself (1893, p. 246) adds the comment, "rather rare but well distributed in the pines." The subspecies was newly described by Grinnell (1926a, p. 405), with type [no. 46464 in Mus. Vert. Zool.] from Arroyo La Encantada, 7200 feet, near La Grulla, taken by himself, October 10, 1925.

The series in the Museum of Vertebrate Zoology represents the following localities: vicinity of Vallecitos, 7500 to 8500 feet, June 5 to 24; vicinity of La Grulla, 7200 feet, May 17 to 26 and October 3 to 13.

***Sitta carolinensis lagunae* Brewster**

San Lucas White-breasted Nuthatch

Rather uncommon resident in the higher mountains of the Cape district; restricted to the Upper Sonoran life-zone. First reported by Belding (1883c, p. 347, under the name *Sitta carolinensis aculeata*) from the Victoria Mountains. The subspecies was newly named by Brewster (1891, p. 149), with type [now no. 214691 in Mus. Comp. Zool.] from the Sierra de la Laguna, collected by M. A. Frazar, May 5, 1887. Further references of note are: Bryant, 1891, p. 198 (San Francisquito, in mountains northwest of Miraflores); Brewster, 1902, p. 203 ("pine forests at high elevations" on Sierra de la Laguna); Ridgway, 1904, p. 446.

***Sitta canadensis* Linnaeus**

Red-breasted Nuthatch

A small colony apparently resident, at least formerly, among the pines on Guadalupe Island. First reported from there by Bryant (1887a, p. 313) as present January to March, inclusive, in 1886, and nesting. Found in the same place subsequently as follows: March 22, 1897 (Kaeding, 1905, p. 138); May 13 to June 11, 1906 (Thayer and Bangs, 1908, p. 105). Specimens are in the A. W. Anthony collection, Carnegie Museum, of following dates: May 26, 1892; September 18 and 20, 1896; March 24, 1897. One skin out of the same collection, taken September 20, 1896, is now in the Museum of Vertebrate Zoology. Curiously, there is no other known place of occurrence of this nuthatch in Lower California.

***Sitta pygmaea leuconucha* Anthony**

White-naped Pigmy Nuthatch

Abundant resident on the higher parts of the Sierra San Pedro Mártir and Sierra Juárez. Restricted to the pine belt, almost altogether within the Transition life-zone. Reported first, and the subspecies newly described, by Anthony (1889a, pp. 77-78), with type [now no. 17622 in Carnegie Mus.] from "San Pedro Mountain," taken by himself April 28, 1889. Bryant (1889b, p. 317) reported it as having been found also by Belding at "Hansen's" [=Laguna Hanson]. Belding himself (1900, p. 3) tells how he discovered this nuthatch at Laguna [Hanson] in May, 1885, and obtained specimens, thus previously to Anthony's description of it (see also Fisher, 1920, p. 40). Some additional references of note are: Anthony, 1893, p. 246; Ridgway, 1896, p. 610, and 1904, p. 459; Hellmayr, 1911, p. 11; Nelson, 1921, p. 131. Sharpe (1903, p. 350) does not like the etymology of the name *Sitta leuconucha* (as being "vox hybrida"), and proposes the substitute [*Sitta*] *albinucha*! The series of specimens in the Museum of Vertebrate Zoology represents the following localities: vicinity of Vallecitos, 7500 to 8500 feet; La Grulla, 7200 to 7500 feet; Laguna Hanson, 5200 feet.

***Baeolophus inornatus murinus* Ridgway**

San Pedro Mártir Plain Titmouse

Fairly common resident locally on the Pacific slope of the northwestern portion of the territory from the vicinity of the United States boundary south to near latitude 30°. Life-zone Upper Sonoran, live-oak association. First reported by

Bryant (1889b, p. 317, under the name *Parus inornatus griseus*) as having been found by A. W. Anthony at the west base of the Sierra San Pedro Mártir. The subspecies was first described by Ridgway (1903, p. 109), with type [no. 133812 in U. S. Nat. Mus.] from Nachogüero Valley [not far from Jacumba, Upper California], taken by Edgar A. Mearns, June 4, 1894 (see also Ridgway, 1904,

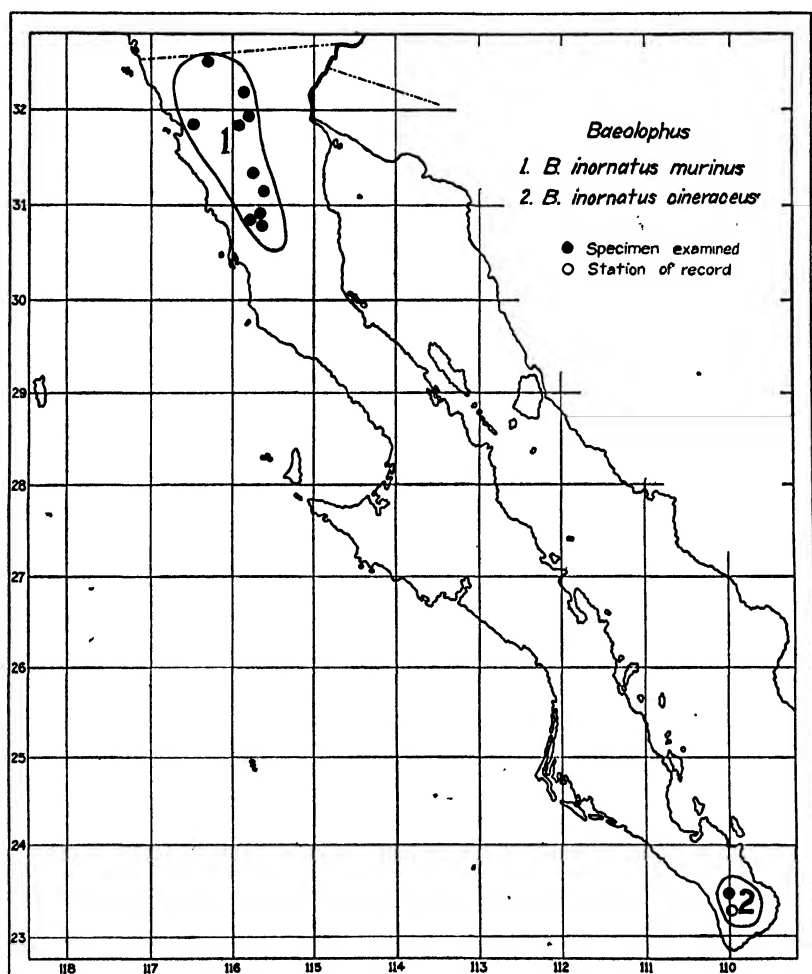


Fig. 23. Distribution of Plain Titmouses, genus *Baeolophus*, in Lower California.

p. 389 [but not here "new subspecies"], and Oberholser, 1917a, p. 322). Upon the erroneous supposition that birds from Nachogüero Valley would prove nearest the race of the San Diegan subfaunal district, the subspecies was re-described, under the name *Baeolophus inornatus affabilis*, by Grinnell and Swarth (1926d, p. 164), with type [no. 47074 in Mus. Vert. Zool.] from Concepción, 6000 feet, Sierra San Pedro Mártir, taken by C. C. Lamb, November 20, 1925 (see Grinnell, 1928b, p. 154). Further published references are: "Several localities" on, or

at the west base of, the San Pedro Mártirs [a skin from Valladares is in Carnegie Mus.] (Anthony, 1893, p. 246); Nelson, 1921, p. 130; Hellmayr, 1911, p. 29, under *Parus inornatus murinus*. Specimens of this race are in the Museum of Vertebrate Zoology from: Nachoguero Valley, 3400 feet; Los Pozos, 4200 feet, El Rayo, 4700 feet, and Laguna Hanson, 5200 feet, in the Sierra Juárez; El Valle de la Trinidad, 2500 feet; Las Cruces, 2600 feet, twenty miles east of Ensenada; Concepción, 6000 feet, and La Jolla, 6200 feet, in the Sierra San Pedro Mártir; San Antonio Ranch, 2100 feet, on upper Santo Domingo River.

***Baeolophus inornatus cineraceus* (Ridgway)**

Ashy Plain Titmouse

Common resident on the higher parts of the mountains in the Cape district. Life-zone Upper Sonoran. First reported, and the subspecies newly separated, by Ridgway (1883b, p. 154, under the name *Lophophanes inornatus cineraceus*), on the basis of a specimen [type is no. 89800 in U. S. Nat. Mus.] taken by Lyman Belding at La Laguna, February 2, 1883. Belding (1883c, p. 347) records this bird as "common" in the Victoria Mountains, whence also, in the section called Sierra de la Laguna, Brewster (1902, p. 204) and Bryant (1891, p. 198), under the name *Parus inornatus cineraceus*, record it. Some technical references are: Ridgway, 1887a, p. 561, and 1904, p. 391; and Hellmayr, 1911, p. 29.

***Penthestes gambeli atratus* Grinnell and Swarth**

San Pedro Mártir Mountain Chickadee

Common resident on the Sierra San Pedro Mártir and Sierra Juárez. Restricted almost altogether to the pine belt; life-zones, Transition and Canadian. Some individuals seek somewhat lower levels adjacent in winter. First reported by Bryant (1889b, p. 317, under the name *Parus gambeli*) as having been found by Belding "about Hansen's" [=Laguna Hanson on the Sierra Juárez], and by Anthony on the San Pedro Mártirs. Anthony (1893, p. 246) reported it not only as "abundant" on the San Pedro Mártirs but as seen "in winter" to the westward, "about Valladares and along the lower valleys." The subspecies was newly described by Grinnell and Swarth (1926d, p. 163), with type [no. 46490 in Mus. Vert. Zool.] from La Grulla, 7200 feet, taken by J. Grinnell, October 12, 1925. Further references are: Ridgway, 1904, p. 409 (in part, under *Penthestes gambeli*); Nelson, 1921, p. 131 (using the name *Penthestes gambeli baileyae*). The series of skins in the Museum of Vertebrate Zoology represents the following localities: Los Pozos, 4200 feet, November 1, and Laguna Hanson, 5200 feet, October 6 to 25, in Sierra Juárez; El Valle de la Trinidad, 2500 feet, November 22 to December 17; Concepción, 6000 feet, November 21; La Grulla, 7200 feet, in May and October; Vallecitos, 7500 to 8500 feet, in May and June.

***Psaltiriparus minimus melanurus* Grinnell and Swarth**

Blackish-tailed Bush-tit

Common resident locally in the northwestern portion of the territory from latitude 30° to, or nearly to, the United States boundary, and chiefly on the Pacific drainage. Life-zone, characteristically Upper Sonoran. Reported first by Bryant (1889b, p. 317, under the name *Psaltiriparus minimus californicus*) as having been found by A. W. Anthony "from El Rosario northward, and from the sea level to 9,000 feet altitude." Anthony (1893, p. 246) considered this bird "very abundant below 3000 feet" on the western side of the Sierra San Pedro Mártir. The subspecies was newly named by Grinnell and Swarth (1926d,

p. 169), with type [no. 46502 in Mus Vert. Zool.] from San José, 2500 feet, latitude 31°, taken by J. Grinnell, October 21, 1925. Some further published records are: San Fernando (Anthony, 1895*d*, p. 143); San Pedro Mártir Mountains (Ridgway, 1904, p. 433, in part, under *Psaltiriparus minimus minimus*); south to El Rosario, "breeding" (Huey, 1926, p. 360). The Museum of Vertebrate Zoology contains specimens of the present race from the following localities: San Ramón, at mouth of Santo Domingo River; San José, 2500 feet; Valladares, 2700 feet; La Grulla, 7200 feet (in October); El Valle de la Trinidad, 2500 feet; Las Cruces, 2600 feet; Laguna Hanson, 5200 feet, and Los Pozos, 4200 feet, in the Sierra Juárez; Nachoguero Valley, 3400 feet; south end of Valle de las Palmas, 1200 feet; Tecate, 1600 feet [intermediate toward *Psaltiriparus minimus californicus*: intergradation evidently takes place at about the latitude of the United States-Mexico line].

***Psaltiriparus minimus grindae* Ridgway**

Grinda Bush-tit

Common resident on the mountains of the Cape district. Life-zone, Upper Sonoran. Recorded first by Ridgway (1883*b*, p. 155) who also names the form as a new species, *Psaltiriparus grindae*, with type [no. 89801 in U. S. Nat. Mus.] from Laguna [in the Sierra de la Laguna], taken by Lyman Belding, February 2, 1883. Belding (1883*c*, p. 347) notes it as "common from 3000 feet altitude upward" in the Victoria Mountains. Bryant (1889*b*, p. 317, and 1891, p. 198) adds San Francisco Mountains and San Francisquito ranch as places of occurrence. Brewster (1902, p. 205) reports Frazar as having found bush-tits down to low levels in the Sierra de la Laguna, even to San José del Rancho; this latter is the northernmost station to date. Some systematic references to this bird are as follows: Ridgway, 1884, p. 96, 1887*a*, p. 565, and 1904, p. 436 (Miraflores added as a place of occurrence); Oberholser, 1903*b*, p. 201; Hellmayr, 1911, p. 55.

***Auriparus flaviceps flaviceps* (Sundevall)**

Arizona Verdin

Common resident of the Colorado desert district, occurring south from the United States boundary to at least latitude 31° on the Gulf, and west to El Valle de la Trinidad. Life-zone, Lower Sonoran. Reported first, certainly this subspecies, by Price (1899, p. 93) as common along the lower Colorado River in December. Stone and Rhoads (1905, p. 686) record it from the mouth of the Hardy River and Bruce's Ranch, in the Colorado delta, and from the Cocopah Mountains, in February. Murphy (1917, p. 99) found it "widely distributed throughout the whole region." Huey (1927*d*, p. 37) reports it from the vicinity of San Felipe, on the Gulf. Specimens are in the Museum of Vertebrate Zoology as follows: Colorado River, twenty miles south of Pilot Knob; Álamo River, twenty miles southwest of Pilot Knob; Las Palmas Cañon, west side Laguna Salada; seven miles east of Cerro Prieto and El Major, in the Colorado delta; San Felipe, on the Gulf; El Cajón Cañon, at east base of Sierra San Pedro Mártir; El Valle de la Trinidad, north end of Sierra San Pedro Mártir.

***Auriparus flaviceps lamprocephalus* Oberholser**

San Lucas Verdin

Abundant resident throughout the lower levels of the peninsula from the Cape north to about 30° latitude. Life-zones, Arid Tropical and Lower Sonoran. First recorded, and the characters of the race pointed out, by Baird (1859, p. 304,

under the name *Paroides flaviceps*) from skins taken by John Xantus at Cape San Lucas (see also Baird, 1864, p. 85, under *Auriparus flaviceps*). Gadow (1883, p. 72, under *Agithalus flaviceps*) recorded it from La Paz, as taken by A. Forrer. Bryant (1890a, p. 150) used the name *Auriparus flaviceps ornatus* to cover Lower Californian birds. The name *lamprocephalus* was newly bestowed by Oberholser (1897b, p. 391), with type [no. 117551 in U. S. Nat. Mus.] from Cape San Lucas, taken by C. H. Townsend, April 7, 1889. Some further ascriptions out of the many applying certainly or probably to this subspecies are: Cape San Lucas, nesting (Baird, Brewer and Ridgway, 1874, I, p. 112); La Paz, nesting (Belding, 1883b, p. 547, and Thayer, 1909a, p. 11); Concepción Bay, Magdalena Bay, Agua Verde Bay, Ángel de la Guardia Island, Cerralvo Island, Miraflores, etc. (Townsend, 1890, p. 137, and 1923, p. 24); Espíritu Santo Island (Nelson, 1921, p. 92); Yubay (A. O. U. Comm., 1910, p. 354); Ángel de la Guardia Island, San Francisquito Bay (nesting), Point Santa Antonita, and Danzante, Monserrate and Cerralvo islands (Mailliard, 1923, pp. 452-456); San José del Cabo, and San Juanico Bay (Kaeding, 1905, p. 138); Comondú, nesting (Bryant, 1889b, p. 318); Triunfo, etc. (Brewster, 1902, p. 207); Santa Margarita Island, etc. (Ridgway, 1904, p. 423); Santana, and Rosarito (Thayer and Bangs, 1907c, p. 138); San Fernando (Anthony, 1895d, p. 143); eight miles east of El Rosario (Huey, 1926, p. 360). Specimens from around latitude 30° are not "good" *lamprocephalus*, being large though dark-colored. The Museum of Vertebrate Zoology contains skins referred to this subspecies as follows: La Paz; San Lucas, on the Gulf; San Ignacio; San Fernando (not typical).

Chamaea fasciata canicauda Grinnell and Swarth

San Pedro Mártir Wren-tit

Common resident of the northwestern section of the territory, chiefly on the Pacific slope and extending north and south between latitudes 32° 30' and 30°; intergrades with the race *henshawi* at about the United States boundary. Belongs to the chaparral association, characteristically within the Upper Sonoran life-zone; but occurs locally also in Transition and Lower Sonoran. Reported first by Bryant (1889b, p. 317, under the name *Chamaea fasciata henshawi*) as having been found by himself, A. W. Anthony, or L. Belding at Ensenada, San Quintín, San Fernando, El Rosario, and on the Sierra San Pedro Mártir. The subspecies, as above, was newly named by Grinnell and Swarth (1926d, p. 169), with type [no. 46510 in Mus. Vert. Zool.] from La Grulla, 7200 feet, on the Sierra San Pedro Mártir, taken by J. Grinnell, October 8, 1925. Some other published records are: nesting at "the highest altitudes" on the San Pedro Mártirs (Anthony, 1893, p. 246); San Quintín (Howell, 1911, p. 153); northwestern "mainland" (Willett, 1913, p. 24); Tecate, and Nachoguero Valley (Ridgway, 1904, p. 690); Ensenada, and Aguaita [lat. 30°] (Huey, 1926, p. 348). The series in the Museum of Vertebrate Zoology represents the following localities: Arroyo Nuevo York, fifteen miles south of Santo Domingo; San Ramón; Colnett; San Telmo; San José, 2500 feet; Aguaje del Sauce, 2600 feet; Valladares, 2700 feet; Concepción, 6000 feet; La Grulla, 7200 to 7500 feet; Vallecitos, 7500 to 8500 feet; El Cajón Cañon, 3200 feet, east base of Sierra San Pedro Mártir; El Valle de la Trinidad, 2500 feet; Laguna Hanson, 5200 feet, and Los Pozos, 4200 feet, Sierra Juárez; Las Cruces, 2600 feet, twenty miles east of Ensenada; Nachoguero Valley, 3400 feet; Tecate, and five miles south of Monument 258 (intermediate toward the race *henshawi*).

***Corthylio calendula calendula* (Linnaeus)**

Eastern Ruby-crowned Kinglet

Presumably fairly common winter visitant to the northern portion of the territory. In the Museum of Vertebrate Zoology are six specimens, of following data, which I identify as of the present race: La Grulla, 7200 feet, October 2 and 15, 1925; San José, 2500 feet, latitude 31°, October 18, 1925; Las Cruces, 2600 feet, twenty miles east of Ensenada, December 29, 1926; Colorado River, twenty miles south of Pilot Knob, October 14, 1927; Nachoguero Valley, 3400 feet, November 15, 1927; collectors, C. C. Lamb or J. Grinnell.

***Corthylio calendula cineraceus* (Grinnell)**

Western Ruby-crowned Kinglet

Winter visitant the entire length of the territory. Common over the northern fourth; in small numbers to the southward. First reported, most likely this race, by Belding (1883c, p. 347, under the name *Regulus calendula*) as "moderately common" in the Victoria Mountains [in February]. Further published records are: Sierra de la Laguna, April 27, November and December (Brewster, 1902, p. 208) [I have examined the Brewster specimens and find them good *cineraceus*]; Rancho San Francisquito, in the Sierra de la Laguna, about November 1 (Bryant, 1891, p. 198); Sierra San Pedro Mártir, "last of April," and west "to the coast in winter and spring," according to A. W. Anthony (Bryant, 1889b, p. 318, and Anthony, 1893, p. 246); lower Colorado River, common in December (Price, 1899, p. 93); along Hardy and Colorado rivers, in February, "many" (Stone and Rhoads, 1905, p. 686); on shipboard twenty miles off west coast, "in late August" (Anthony, 1897a, p. 58). Specimens are in the Museum of Vertebrate Zoology, of following data: La Grulla, 7200 feet, October 8 and 15; La Jolla, 6200 feet, October 16; San José, 2500 feet, October 20, 23 and 26; San Telmo, December 1; San Ramón, March 16; El Valle de la Trinidad, November 29 and December 7; Laguna Hanson, 5200 feet, October 16; Las Cruces, 2600 feet, January 7; south end of Valle de las Palmas, 1200 feet, January 5; Nachoguero Valley, 3400 feet, November 16; Las Palmas Cañon, west side Laguna Salada, November 9.

***Corthylio calendula obscurus* (Ridgway)**

Dusky Ruby-crowned Kinglet

Common resident on Guadalupe Island, where restricted to the groves of cypresses and pines. First reported, and the race newly named, by Ridgway (1876b, p. 184) from specimens taken by Edward Palmer; the type is no. 70038 in U. S. Nat. Mus., taken April 1, 1875 (*vide* C. W. Richmond, *in litt.*). The most important general account remains that of Bryant (1887a, p. 314, under the name *Regulus obscurus*). Other records of note are: Ridgway, 1877, pp. 59ff (phylogeny), 1887a, p. 568, and 1904, p. 710; Miller, 1915, p. 235 (systematic status); Gaylord, 1897a, p. 42 ("abundant" in September, 1896); Kaeding, 1905, p. 138 ("extremely rare" in March, 1897); Thayer and Bangs, 1908, p. 105 ("about thirty-five individuals" seen in spring of 1906); Huey, 1924b, p. 581 (apparently still existing in July, 1923, though not definitely so stated). In the Museum of Vertebrate Zoology are two specimens collected by A. W. Anthony or one of his helpers, September 20 and 21, 1896.

***Polioptila caerulea amoenissima* Grinnell**

Western Blue-gray Gnatcatcher .

Fairly common summer resident locally in the mountains of the northwestern section of the territory. Winters in the adjacent lowlands and south (probably this race) to about latitude 28°. Belongs chiefly to the Upper Sonoran life-zone. First recorded, probably this subspecies, by Bryant (1886, p. 64, under the name *Polioptila caerulea*) from Cedros Island, January 11, 1885. Subsequent published records are: Colorado River at the Mexican boundary, and Bruce's Ranch in the delta, "abundant" in February (Stone and Rhoads, 1905, p. 687, under the name *Polioptila caerulea obscura*); Santana and San Jabier, March 14 to April 1 (Thayer and Bangs, 1907c, p. 138); Los Coronados Islands, "about ten individuals" [in April] (Osburn, 1909, p. 138); San Quintín [in late April] (Howell, 1911, p. 153); northwestern "mainland" (Willett, 1913, p. 24). Specimens are in the Museum of Vertebrate Zoology of following data: La Grulla, 7200 feet, May 19; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir, May 15 to June 3; El Valle de la Trinidad, 2500 feet, December 14; San José, 2500 feet, May 6, September 27 and 28; San Telmo, November 30; Colnett, October 28; south end of Valle de las Palmas, January 12; Colorado River twenty miles south of Pilot Knob, October 17; Colorado River at latitude 32° 15', March 5; Álamo River, twenty miles southwest of Pilot Knob, January 20 and 30; five miles east of Cerro Prieto, February 12; Las Palmas Cañon, west side Laguna Salada, October 29 and November 7.

***Polioptila caerulea obscura* Ridgway**

San Lucas Blue-gray Gnatcatcher

Fairly common resident in the Cape district and thence northward (probably this race) to about latitude 28°. Apparently occurs through all the life-zones from Arid Tropical to Upper Sonoran. First reported by Baird (1864, p. 74, under the name *Polioptila caerulea*) as collected by John Xantus at Cape San Lucas, October 10, 1859. The subspecies was newly named by Ridgway (*in* Belding, 1883b, p. 535), with type [no. 87530, in U. S. Nat. Mus.] taken by Lyman Belding at San José del Cabo, April 17, 1882 (see Grinnell, 1926f, p. 495). Further published records are: Cape region generally, and Victoria Mountains in particular, "common" [but the gnatcatchers evidently confused] (Belding, 1883b, p. 534, and 1883c, p. 346); San Julio, near Comondú, in March (Bryant, 1889b, p. 318); La Paz, San José del Cabo, San José del Rancho, and to "summits" of Sierra de la Laguna (Brewster, 1902, p. 209); La Paz, breeding (Thayer, 1909a, p. 11); Agua Verde Bay, Concepción Bay, Cerralbo Island, La Paz, and Miraflores (Townsend, 1923, p. 25).

***Polioptila melanura californica* Brewster**

California Black-tailed Gnatcatcher

Common resident at the lower altitudes in the extreme northwestern section of the territory, from about latitude 30° north to the United States boundary, and east to the eastern base of the Sierra San Pedro Mártir. Life-zone, chiefly Lower Sonoran; shows preference for a sparse, low type of brush usually entering into the "wash" association. First reported by Bryant (1889b, p. 318, under the name *Polioptila californica*) from San Fernando, on the authority of A. W.

Anthony. Other published records are: San Fernando, nesting (Anthony, 1895*d*, p. 143); northwestern "mainland" (Willett, 1913, p. 24); San Quintín (McLellan, 1926, p. 318); El Rosario (Grinnell, 1926*f*, p. 499). The basis of the ascription (A. O. U. Comm., 1910, p. 358) to Espíritu Santo Island "in winter" [as if this species were migratory!] is unknown to me. The series of skins in the Museum of Vertebrate Zoology represents the following localities: El Valle de la Trinidad, 2500 feet; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir; San José, 2500 feet; San Telmo; Colnett; San Ramón; Arroyo Nuevo York, fifteen miles south of Santo Domingo; south end of Valle de las Palmas, 1200 feet; five miles south of Monument 258, at United States boundary.

***Poliioptila melanura melanura* Lawrence**

Plumbeous Black-tailed Gnatcatcher

Common resident locally in the Colorado Desert district, ranging south from the United States boundary to at least latitude 31° on the Gulf. Life-zone, Lower Sonoran. First reported by Price (1899, p. 93, under the name *Poliioptila plumbea*) from the "mesa" near the Colorado River. Other records are: Bruce's Ranch and Pescadero Slough, in Colorado delta, and Cocopah Mountains (Stone and Rhoads, 1905, p. 687); near Mexicali, and "desert washes" (Murphy, 1917, p. 100); Colorado Desert district (Nelson, 1921, p. 126); San Felipe Bay (Grinnell, 1926*f*, p. 499, and Huey, 1927*d*, p. 37). Specimens in the Museum of Vertebrate Zoology represent the following localities: El Major, in the Colorado delta; seven miles east of Cerro Prieto; Las Palmas Cañon, west side Laguna Salada; San Felipe, on the Gulf; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir; El Valle de la Trinidad, 2500 feet (November 16).

***Poliioptila melanura margaritae* Ridgway**

Santa Margarita Black-tailed Gnatcatcher

Common resident, locally, in the subterminal section of the peninsula from about latitude 29° to latitude 24° 30'. Life-zone, chiefly Lower Sonoran. Reported first (this subspecies, without any doubt) by Belding (1883*a*, p. 529, under the name *Poliioptila californica*) from Santa Rosalía Bay; then by Bryant (1889*b*, p. 318, under *Poliioptila plumbea*) from Santa Margarita Island and from the mainland on latitudes 26° and 28°. The subspecies was newly separated by Ridgway (1904, p. 733, under the name *Poliioptila margaritae*), with type [no. 149938 in U. S. Nat. Mus.] from Santa Margarita Island, taken May 2, 1888, by someone on the U. S. S. "Albatross" (see Grinnell, 1926*f*, p. 497). Other published records, belonging at least in part here, are: San Juanico Bay (Kaeding, 1905, p. 138) [I have examined the specimens taken]; Magdalena Bay (McLellan, 1926, p. 318); Santana and Rosarito (Thayer and Bangs, 1907*c*, p. 138); critical comment (Hellmayr, 1911, p. 14, and Oberholser, 1918*d*, p. 214); Santa Margarita Island (Townsend, 1923, p. 25); Puerto Escondido (Mailliard, 1923, p. 456). Specimens in the Museum of Vertebrate Zoology come from the following localities: San Ignacio; San Lucas, on the Gulf; Rancho Mesquital, thirty-three miles west of Calmalli. Intergradation between the races *margaritae* and *californica* evidently takes place from 29° to 30° latitude. I can now find no good basis for ascribing a gnatcatcher of the "black-tailed" group to Cedros Island (see Grinnell, 1926*f*, p. 499).

Poliophtila melanura abbreviata* Grinnell*San Lucas Black-tailed Gnatcatcher**

Common resident in the Cape district proper; none reported (this subspecies) north of La Paz. Life-zones, Arid Tropical and Lower Sonoran. First reported by Baird (1859, p. 304, under the name *Poliophtila melanura*) from Cape San Lucas, as taken by John Xantus (see Baird, Brewer and Ridgway, 1874, I, p. 82).

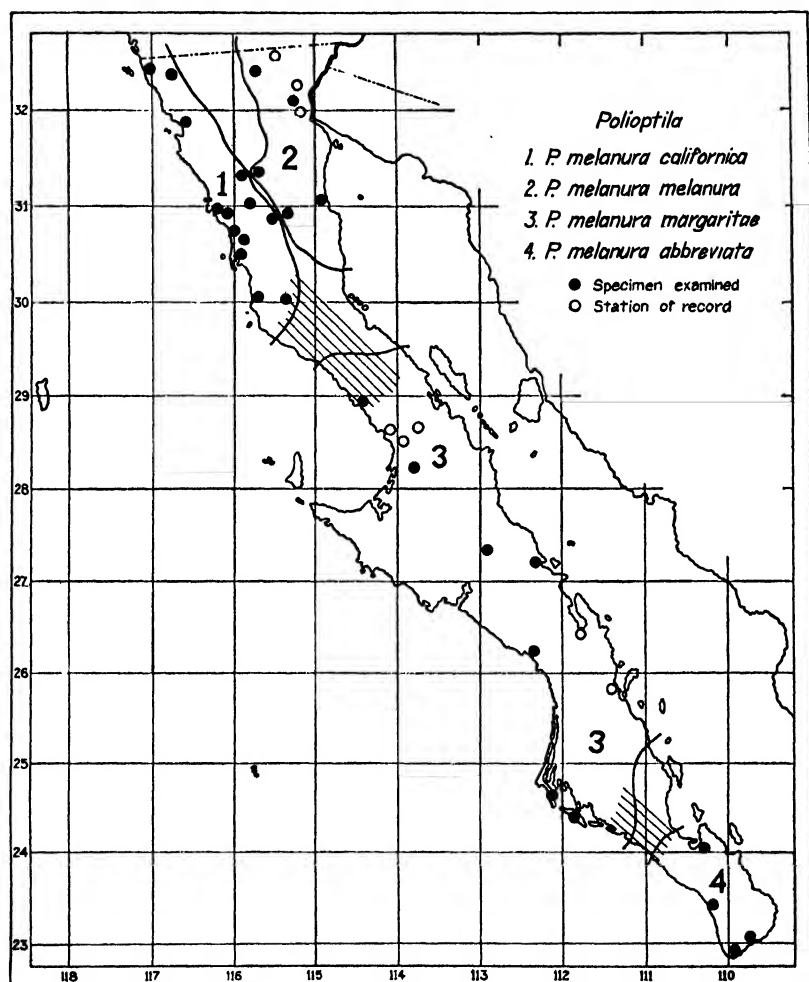


Fig. 24. Distribution of Black-tailed Gnatcatchers, part of genus *Poliophtila*, in Lower California. Intergradation between races shown by shading.

The subspecies was named by Grinnell (1926f, p. 497), with type [no. 27835 in coll. Calif. Acad. Sci.] from Cape San Lucas, taken by Frank Tose, May 28, 1925. Further published references are: Brewster, 1881, p. 103, under *Poliophtila plumbea* (Cape San Lucas); Belding, 1883b, pp. 535 and 547, and 1890, p. 249

(La Paz and elsewhere in the Cape district); Brewster, 1902, p. 210 (La Paz, and San José del Cabo); Townsend, 1890, p. 137, and 1923, p. 25, in part (La Paz, San José del Cabo, and Cape San Lucas); McLellan, 1926, p. 318 (Cape San Lucas).

***Myadestes townsendi* (Audubon)**

Townsend Solitaire

Sparingly winter visitant at the north, occurring south to about latitude 31° and in one instance reaching Guadalupe Island. Published records are few, as follows: one bird found by A. W. Anthony "in the fall in a juniper thicket, at an altitude of 2,400 feet" (Bryant, 1889*b*, p. 319); this was presumably at the west base of the Sierra San Pedro Mártir, though Anthony himself, in subsequent papers, fails to mention the species and I was unable to find a specimen of Solitaire in his collection in the Carnegie Museum. The second edition of the A. O. U. Check-List (1895*b*, p. 316) ascribes the species to "northern Lower California." Kaeding (1905, p. 138) records one bird as "seen on Guadalupe Island March 22nd," 1897. There are specimens in the Museum of Vertebrate Zoology, with following data: La Grulla, 7200 feet, Sierra San Pedro Mártir, three collected by J. Grinnell, October 8, 10 and 11, 1925; El Valle de la Trinidad, 2500 feet, two collected by C. C. Lamb, November 29 and 30, 1926; Tecate, 1600 feet, one collected by C. C. Lamb, January 23, 1927. Also seen (C. C. Lamb, MS) at Laguna Hanson, Sierra Juárez, October 5, 1926.

***Hylocichla ustulata, ustulata* (Nuttall)**

Russet-backed Thrush

Fairly common late spring and autumn transient, occurring here and there from one end of the territory to the other. First reported by Belding (1889*b*, p. 58, under the name *Turdus ustulatus*) as having been found by him "common south of Campo [upper California], in the mountains, to near Hansen's [Laguna Hanson in Sierra Juárez], as late as May 14," 1884, and also a "few between San Diego and San Pedro Mountains . . . in May, 1885." Additional published information is as follows: Sierra San Pedro Mártir, "migrants" May 21 and 25, 1893 (Anthony, 1893, p. 246) [Anthony-taken specimens in Carnegie Museum examined by me]; Sierra de la Laguna, May 4, 7 and 16, and Triunfo, June 13, in 1887 (Brewster, 1902, p. 210) [I have examined the five specimens in the Brewster collection, and all are good *ustulata*, but migrants, not "breeding" birds as Brewster thought]; "Gardiners Laguna, Salton River," Mexican boundary (Oberholser, 1899*a*, p. 25, under the name *Hylocichla ustulata oedica*); Laguna Hanson, October 12, 1926 (Huey, 1927*a*, p. 154). Specimens are in the Museum of Vertebrate Zoology of following data: Laguna Hanson, 5200 feet, October 8 and 16, 1926; El Cajón Cañon, 3200 feet, east base Sierra San Pedro Mártir, May 16 and 20, 1926; La Grulla, 7200 feet, May 17 and 23, 1925, and October 9, 10, 12 and 15, 1925; San José, 2500 feet, September 27 and October 20, 21 and 25, 1925; San Antonio Ranch, on upper Santo Domingo River, April 25, 1925.

***Hylocichla ustulata swainsoni* (Tschudi)**

Olive-backed Thrush

Rare migrant; only two known instances of occurrence, as follows: La Paz, specimen taken October 11, 1924 (Lamb, 1925*d*, p. 118); Vallecitos, 8500 feet, Sierra San Pedro Mártir, specimen (in Mus. Vert. Zool.) taken June 8, 1925, by A. E. Borell.

***Hylocichla guttata auduboni* (Baird)**

Audubon Hermit Thrush

Summer resident and apparently breeding in the Sierra de la Laguna of the Cape district. One ascription (Brewster, 1902, p. 212), as follows: Found by M. A. Frazar, during May and up to June 9, 1887, in "deep, moist, shady cañons, and also, to some extent, dry pine woods." I have examined the six specimens (in Mus. Comp. Zool.) taken by Frazar, and agree with Brewster that they are *auduboni* and almost certainly breeding birds; they are not *sequoiensis* (see also Ridgway, 1907, p. 46). I identify also as good *auduboni* a specimen (no. 46553, Mus. Vert. Zool.) taken by myself October 15, 1925, at La Grulla, 7200 feet altitude, in the Sierra San Pedro Mártir. This must be looked upon, I think, as a far vagrant or migrant.

***Hylocichla guttata guttata* (Pallas)**

Alaska Hermit Thrush

Common as a transient or winter visitant, reaching the entire length of the territory; particularly numerous in the northwestern section. First reported, this subspecies, by Baird (1864, pp. 14-15, under the name *Turdus nanus*) from a specimen taken by John Xantus in January, 1861, on "San Gertrude Mt., Cape St. Lucas" (see Ridgway, in Belding, 1883b, p. 533, under *Hylocichla unalascae*, and Ridgway, 1907, p. 40). Belding (1889b, p. 63, under *Turdus aonalaschkae*, and 1883c, p. 346) records Hermit Thrushes as wintering commonly in the Victoria Mountains, of the Cape district; Brewster (1902, p. 211) records definitely as *guttata* one of Belding's specimens taken at Casa Pintada, February 17, 1883. I have examined three Belding-taken skins (nos. 90067-68, 89798, in U. S. Nat. Mus.), two from Casa Pintada and one from La Laguna, and all are *guttata*. Three Hermit Thrushes were taken by Bryant (1887a, p. 317) on Guadalupe Island, January 7 and 28, and March 26, 1886; I assume these to have been of the race *guttata*, but the point cannot now be proven. Part of the Hermit Thrushes seen by Bryant (1889b, p. 319) on Santa Margarita Island, in January, may have been of this race. Huey (1926, p. 360) reports *guttata* from Santo Domingo [lat. 30° 45'], "abundant" in February and found there "as late as April 29." The series of *guttata* in the Museum of Vertebrate Zoology provides distributional and seasonal data as follows: Tecate, January 23; south end of Valle de las Palmas, January 6; Las Cruces, twenty miles east of Ensenada, seven specimens, December 29 to January 7; Todos Santos Islands, January 12 and 15; Laguna Hanson, 5200 feet, Sierra Juárez, October 6 and 16; El Valle de la Trinidad, November 22, December 13 and 14; Alamo River, twenty miles southwest of Pilot Knob, January 19; La Grulla, 7200 feet, Sierra San Pedro Mártir, October 4; Villadares, 2700 feet, April 23; San Ramón, mouth of Santo Domingo River, March 17 and 23.

***Hylocichla guttata nanus* (Audubon)**

Dwarf Hermit Thrush

Varyingly common as a transient or winter visitant, with scattering instances of occurrence the whole length of the peninsula. First reported, definitely this subspecies, by Brewster (1902, p. 214) who records four specimens [which I have examined] of good *nanus* from the Cape region: Triunfo, December 5, and Sierra de la Laguna, April 27 and 30. Kaeding (1905, p. 138) records this race from San Martín Island, March 12, and Todos Santos Islands, March 10, 1897. A

skin of latter place and date is in the Carnegie Museum, as also two from Valladares, taken by A. W. Anthony December 10, 1888. I have examined a specimen in the Thayer collection from El Rosario, taken November 9, 1906. Specimens of *nanus* are contained in the Museum of Vertebrate Zoology as follows: Todos Santos Islands, January 17 and 18, 1927; Las Cruces, 2600 feet, twenty miles east of Ensenada, December 30, 1926, and January 1 and 8, 1927; El Valle de la Trinidad, 2500 feet, November 23, 1926; San José, 2500 feet, October 18, 21 and 23, 1925; five miles south of Monument 258, December 27, 1927; Alamo River, twenty miles southwest of Pilot Knob, January 23, 1928.

Hylocichla guttata slevini Grinnell

Monterey Hermit Thrush

Of scattering occurrence in migration or in winter. Definite records are as follows: Santa Margarita Island, specimen February 8, 1888 (Grinnell, 1901, p. 259) [probably covered in the record by Bryant (1889b, p. 319, under the name *Turdus aonalaschkae*) of Hermit Thrushes seen by him on Santa Margarita Island "in January, 1888"]; "several" taken in fall and spring in various parts of the Cape district (Lamb, 1925d, p. 118). I have examined a skin in the Thayer collection, taken at Miraflores, December 6, 1908. Specimens of *slevini* are in the Museum of Vertebrate Zoology as follows: La Grulla, 7200 feet, Sierra San Pedro Mártir, October 10 and 13, 1925; San Felipe, on the Gulf, April 12, 1926.

Turdus migratorius propinquus Ridgway

Western Robin

Varyingly numerous winter visitant south over the northern fourth of the territory; vagrants have reached Guadalupe Island and the Cape district. There is some evidence also that robins summer in the San Pedro Mártir district. The first report for Lower California is Bryant's (1887a, p. 317, under the name *Merula migratoria propinqua*) from Guadalupe Island, in December and January, 1885-86. According to Bryant (1889b, p. 319, under *Turdus migratoria propinqua* [sic]), L. Belding had found the species common in April at Ensenada and at San Rafael [east of Ensenada] in winter, and A. W. Anthony had found it during winter south to San Quintín and "a few" as late as May 10 on the Sierra San Pedro Mártir [at La Grulla, in 1889 (see Anthony, 1893, p. 246)]. Other published records of note are: 90 miles southeast of San Diego [upper California], April 22 (Belding, 1890, p. 257); Todos Santos Islands, March 10 (Kaeding, 1905, p. 138); Santo Domingo, April 29 (Huey, 1926, p. 360); El Rosario, November 15 (Thayer and Bangs, 1907c, p. 138, under the name *Planesticus migratorius propinquus*); Colorado delta, in February (Rhoads, 1905, p. 690); San José del Rancho [Cape district], December 22 [one specimen, not typical] (Brewster, 1902, p. 215). Skins with following data are in the Museum of Vertebrate Zoology: Nachoguero Valley, 3400 feet, November 17; Los Pozos, 4200 feet, October 29; El Valle de la Trinidad, 2500 feet, December 13; San José, 2500 feet, October 23; San Telmo, November 27; San Ramón, mouth of Santo Domingo River, December 28 and March 20; Las Cruces, east of Ensenada, December 31 and January 2; five miles east of Cerro Prieto, in the Colorado delta, February 8; Colorado River at latitude 32° 15', March 3; ten miles west of Pilot Knob and one mile south of the United States boundary, March 13. C. C. Lamb (MS) saw a caged robin at San Ignacio that had been captured there in February, 1927.

Turdus confinis Baird

San Lucas Robin

Common resident in the mountains of the Cape district. Life-zone rather strictly Upper Sonoran; but vagrants may extend to the adjacent lowlands, even to the seacoast. First reported, and the species newly described, by Baird (1864, p. 29, under the name *Turdus confinis*) from a single specimen taken by John Xantus supposedly at "Todos Santos, Cape St. Lucas" in the summer of 1860. The type is no. 23789 in the United States National Museum. Dr. C. W. Richmond (*in litt.*) informs me that this type was originally catalogued as "*Turdus*" from "Mazatlan." Later, Baird described it as from Todos Santos (Xantus had a Todos Santos Mission among his localities), summer of 1860. Richmond says: "I presume Baird got this data from Xantus, but the sex and original number are missing and I do not find any robin listed in the field catalogues I have seen." The type-locality is thus somewhat in doubt, especially in as much as no one since Xantus's time appears to have found this species at Todos Santos. Definite published locality ascriptions of note are: La Laguna (Ridgway, 1883d, p. 158, and Belding, 1883c, p. 346, under the name *Merula confinis*); Sierra de la Laguna, San José del Rancho, and "road to Triunfo" (Brewster, 1902, p. 216); Rancho San Francisquito (Bryant, 1891, p. 198); San José del Cabo, April 22 (Kaeding, 1905, p. 138); Sierra de la Laguna, eggs (Thayer, 1911a, p. 77); San Bernardo Mountain (Townsend, 1923, p. 25). Some systematic references are: Baird, *in* Cooper, 1870, p. 9; Baird, Brewer and Ridgway, 1874, I, p. 27 (using the name *Turdus migratorius*, var. *confinis*); Seebohm, 1881, p. 222; Ridgway, 1887a, p. 578, and 1907, p. 103, under the name *Planesticus confinis* (additional locality, Mount Miraflores).

Ixoreus naevius meruloides (Swainson)

Northern Varied Thrush

Irregular winter visitant into the northern section of the territory; casually to Guadalupe Island. Published records are as follows: Guadalupe Island, specimen obtained March 4, 1886 (Bryant, 1887a, p. 318, and 1889b, p. 319, under the name *Hesperocichla naevia*) [the exact subspecies cannot now be determined, but all the factors considered, it was probably *meruloides*]; Laguna Hanson, in the Sierra Juárez, specimens taken November 17 and 18, 1926, and Rancho San Pablo, ten miles southeast of Alamo, one seen November 26, 1926 (Huey, 1927a, p. 154).

Sialia mexicana occidentalis J. K. Townsend

Western Mexican Bluebird

Winter visitant at the extreme north. The only verified occurrences of *occidentalis* to date of this writing are attested by skins in the Museum of Vertebrate Zoology with following data: Nachoguero Valley, just south of the United States boundary, November 16 and 21, 1927; three miles east of Tecate, 1600 feet, January 22 and 23, 1927; all collected by C. C. Lamb. It is most likely that the bluebirds reported from the Colorado delta, as seen numerously there in December and February (Price, 1899, p. 93, and Rhoads, 1905, p. 690, under the name *Sialia mexicana*), belonged to the present race, rather than to *anabelae*.

Sialia mexicana anabelae Anthony

San Pedro Mártir Mexican Bluebird

Abundant resident on the Sierra San Pedro Mártir and Sierra Juárez, with partial scattering down to adjacent lower ground in winter. Breeds chiefly in the Transition life-zone. First recorded, and the subspecies newly named, by Anthony (1889a, p. 79), with type [now no. 18627 in Carnegie Mus.] taken by himself on "San Pedro Mountain," April 28, 1889. Anthony's (1889a, pp. 80-81) *Sialia mexicana* from the San Pedro Mártirs and from Valladares [December 4] are all also good *anabelae*. Other references probably if not certainly belonging here, whichever name was used, are: Ridgway, 1894a, pp. 145-160 (minute descriptions of specimens); Bryant, 1889b, p. 320 (San Rafael, east of Ensenada, "in May" according to Belding); Anthony, 1893, p. 247, under the name *Sialia mexicana* (from sea level to top of San Pedro Mártirs "during migrations," "a few lingering to nest with the local race" [!]; Ridgway, 1896, p. 613, and 1907, pp. 151, 155 (Nachoguero Valley [in summer?], etc.); Howell, 1912, p. 191, under the name *Sialia mexicana occidentalis* (Todos Santos Islands, April 19); Huey, 1927d, p. 37 (San Felipe, on the Gulf, March 31 and April 13: specimen of latter date examined by me). I have examined Anthony's series, studied by Ridgway, and consider every one of them properly *anabelae*; the type was an individual extreme. The series of specimens of *anabelae* in the Museum of Vertebrate Zoology represents the following localities: south end of Valle de las Palmas, January; Las Cruces, east of Ensenada, December; Laguna Hanson, 5200 feet, Sierra Juárez, October; El Valle de la Trinidad, 2500 feet, November; Vallecitos, 7500 to 8500 feet, Sierra San Pedro Mártir, June; La Encantada, 7500 feet, May; La Grulla, 7200 feet, May and October; Valladares, 2700 feet, April 23; San José, 2500 feet, October 23 and November 10.

Sialia currucoides (Bechstein)

Mountain Bluebird

Irregularly appearing winter visitant into the northern fourth of the territory, reaching casually to Guadalupe Island. Published records are as follows: Guadalupe Island, three individuals seen in winter of 1885-86 up to February 15, and one obtained December 29, 1885 (Bryant, 1887a, p. 318, under the name *Sialia arctica*); lower Colorado River, "common" [in December, 1898] "about alfalfa fields" (Price, 1899, p. 93); Rancho San Pablo, ten miles southeast of Alamo, December 5, 1926, "a flock of a dozen" (Huey, 1927a, p. 154). Specimens are in the Museum of Vertebrate Zoology from San Ramón, at mouth of Santo Domingo River, December 11 and 15, 1925, from Santo Domingo, December 3 and 4, 1925, and from the Colorado River, 23 miles south of El Major, February 20, 1928, all collected by C. C. Lamb.

HYPOTHETICAL LIST

In this list are entered the names of species and subspecies which have been ascribed to Lower California, but upon grounds which at the present time look to be more or less unsatisfactory. In some cases there is doubt as to actual occurrence within the region here restrictedly dealt with, because of possible confusion of geographic place names. In other cases, there is question as to correct identification. Again, forms have been described from Lower California concerning the validity of which there is now doubt. And two or three species owe their presence, either regularly or casually, to man's agency, these not being considered properly belonging to the native fauna. The author's aim is thus to include in this hypothetical list all forms credited to the area under consideration which cannot on any strict basis claim standing in the preceding general list. In most cases the nature of the evidence determining the course followed is given, together with the chief references. There are 53 entries under this heading.

***Lunda cirrhata* (Pallas)**

Tufted Puffin

Ogilvie-Grant (1898, p. 612) includes "Lower California" in a general statement of the range of this species, but without specifying any basis. As is sometimes clearly evident in other cases in the British Museum "Catalogues," this *may* have been meant as *southern* California. At any rate, it is not conclusive.

There remains only one seemingly definite ascription: "southward in winter to Lower California (Cape Los Martires);" and measurements of one "adult male" tabulated as from the same locality (Ridgway, 1919, p. 794). Through the kindness of Dr. C. W. Richmond, this specimen (no. 23384, U. S. Nat. Mus.) is before me (January 29, 1927). There are two labels on it, the older of which has "Exploration of Lower California. John Xantus." printed on it, and handwritten on the same side: "Mormon cyrrhata. ♂. 10,114 | Los Martyres Cape. 1861." On the other side: "14½, 26½. Iris white | bill & feet bright red." It was "entered" in the National Museum catalogue under date January 20, 1862.

As far as can be found, there is no cape now bearing that locality name in Lower California. There is, however, a Los Mártires Ranch on the Gulf side near latitude 23° 38' (Hydrographic Chart no. 1664). Dr. Richmond finds, in one of Xantus's field catalogues preserved in the National Museum, a locality heading as follows: "Los Martyres (Cape) Gulf of Cala, between Lapas & San Jose." This locality was thus likely to have been in the vicinity of said ranch. Dr. Richmond says it is clear by the context that Xantus was there in November or December, 1859, and in January, 1860. The latter's field numbers at that time ran around the 2600's, and all the recorded ones pertain to invertebrates; no birds were entered from that locality.

As to the skin, it is in full summer plumage—not winter; it was a breeding bird, as shown by the presence of “egg-pockets” on the belly. In “make” it is suggestively like three skins of Tufted Puffin in the Museum of Vertebrate Zoology from the old J. G. Cooper collection, received by him from F. Gruber, and taken on the Farallon Islands. The statement of measurements and colors on the labels of these and the “Lower California” specimen show suggestive similarities, though in each case evidently copied from some preceding label or register. Gruber, a San Francisco taxidermist, is known to have himself visited the Farallones previous to 1862, and he is known to have received frequently birds for stuffing from the lighthouse keeper on the Farallones, doubtless as the market demand for them justified.

Furthermore, Dr. Richmond informs me that the National Museum catalogue of the Xantus collection contains entries of three Tufted Puffins definitely stated to be from the Farallon Islands and “prepared by F. Gruber.” So that Xantus, in some way or another *had* latterly got birds from Gruber, which he sent in along with his own Lower California collections to the National Museum. Xantus’s high field number on the Puffin label, “10,114,” lends support to this idea. There is, it seems to me therefore, a good chance that, in copying data somewhere along the line, an error got in, perhaps at the outset because one of the printed Xantus Lower California labels had been affixed to the specimen in question.

The above circumstances, together with the fact that the southernmost established breeding station for the Tufted Puffin is Santa Barbara Island, ten degrees of latitude north of the Cape San Lucas district, and the fact that the species is not migratory but permanently resident off the coast of upper California, compel me to assign the two Lower California ascriptions here cited to the hypothetical list.

Cepphus columba Pallas

Pigeon Guillemot

Known only from the statement of Ridgway (1919, p. 741) that the species occurs “southward in winter to Lower California (Point Sandoval; San Nicolás Island).” Upon inquiry, I find that there are in the United States National Museum two skins bearing labels which show them to be the basis of Ridgway’s ascription. These skins, together with some important appertaining information, are, by courtesy of Dr. C. W. Richmond, now before me (January 29, 1927). Very much the same situation develops with regard to them as in the case of the “Lower California” Tufted Puffin [which see, p. 235]. The labels are of the same type and bear the same sort of data. The skins are of strikingly similar “make” to two Gruber-prepared specimens now in the Museum of Vertebrate Zoology, from the Farallon Islands.

The San Nicolás Island specimen of Pigeon Guillemot (no. 23389 U. S. Nat. Mus., orig. no. 8033 John Xantus) can easily be disposed of, I think; for in the printed phrase on the face of the older label, “Exploration of Lower California,” the last two words are crossed out, and “Pacific Ocean” written in, in the same hand-writing as the rest of the legend on the label. I know of no San Nicolás Island in Lower Californian waters. Very likely a Pigeon Guillemot came to Gruber in San Francisco from a vessel which had been to San Nicolás Island, off southern upper California.

The other “Lower Californian” skin has the printed “John Xantus” label (no. 23388, U. S. Nat. Mus., orig. no. 9420) bearing, besides other data, “Sandoval point. 1860.” I have not found any such place on any map of Lower California, or of upper California; either.

Both of these "Lower California" Pigeon Guillemots are in full summer, breeding plumage; one shows what I take to be an "egg-pocket" on one side of the median line of the belly. They are absolutely *not* winter birds. And anyway, so far as I know, the species is permanently resident to the southernmost limit of its established breeding range, among the Santa Barbara Islands, southern upper California.

It is thus necessary, at least pending possible future substantiation, to put this species in the "hypothetical list" of Lower Californian birds.

***Stercorarius longicaudus* Vieillot**

Long-tailed Jaeger

Ascribed once to Lower California, but basis unsatisfactory: two jaegers, "probably" this species, seen near Guadalupe Island, September 17, 1896 (Gaylord, 1897a, p. 42).

***Larus nelsoni* Henshaw**

Nelson Gull

A bird recorded under this name was taken at San Gerónimo Island, March 18, 1897 (A. O. U. Comm., 1910, p. 37; Cooke, 1915, p. 30; Ridgway, 1919, p. 596). But the latest critic (Dwight, 1925, p. 250) inclines to the view that this bird was of some hybrid origin, perhaps involving *Larus argentatus* and *L. hyperboreus*.

***Puffinus amaurosoma* (Coues)**

Sooty Shearwater

This supposed new species was described by Coues (1864, p. 124) under the name *Nectris amaurosoma*, with type from Cape San Lucas. The author, himself, not long afterward, disclaimed its validity. The name now stands as a synonym of *Puffinus griseus*, which see, p. 65.

***Thyellodroma bulleri* (Salvin)**

New Zealand Shearwater

What was thought to be this shearwater was seen in April and early June, 1897, near Cape San Lucas (Anthony, 1898b, p. 39); also in the same locality, June 5, 1897 (Kaeding, 1905, p. 108); also between Ensenada and Magdalena Bay in the summer of 1922 (Anthony, 1925, p. 285). No specimen taken; only "sight records" which, it now seems to me, are not conclusive.

***Oceanodroma monorhis chapmani* Berlepsch**

Chapman Petrel

This supposed new petrel was named by Berlepsch (1906, p. 185) with type from one of the San Benito Islands. The name was shortly disposed of by the A. O. U. Committee (1908, p. 390) as a synonym of *Oceanodroma socorroensis*, which see, p. 66.

***Oceanodroma townsendi* Ridgway**

Townsend Petrel

Very shortly after its description by Ridgway (1893, p. 687), with type from Cape San Lucas, this supposed species was found (A. O. U. Comm., 1895a, p. 168) "not to be different" from *Oceanodroma melania* (Bonaparte), which see, p. 68.

***Phalacrocorax olivaceus mexicanus* (Brandt)**

Mexican Cormorant

The one record, by Rhoads (1905, p. 687, under the name *Phalacrocorax mexicanus*), for the Colorado delta, "observed," is almost certainly erroneous, pertaining, rather, to the Farallon Cormorant, *Phalacrocorax auritus albociliatus*, which see, p. 70.

***Mergus americanus* Cassin**

American Merganser

Perhaps winter visitant northerly. There are but two records, not altogether conclusive: Colorado delta, "a few" "observed" in February, 1905 (Rhoads, 1905, p. 687, under the name *Merganser americanus*). Although cited subsequently, as in the A. O. U. Check-list (1910, p. 66) and by Bent (1923, p. 12, under *Mergus merganser americanus*), I agree with Phillips (1926, p. 263, under *Mergus merganser*) in considering this record dubious. Huey (1927*d*, p. 19) records "four males of this species" as "seen" at San Felipe, on the Gulf, April 11, 1926.

***Nyroca collaris* (Donovan)**

Ring-necked Duck

Evidence of occurrence not quite satisfactory; at best, the species may be a rare winter visitant. Belding (1883*c*, p. 352, under the name *Fulix collaris*) recorded it as "positively identified" by him in the Cape district, but "rare." In this regard, Dr. Richmond has made search for me, of the records in the United States National Museum without finding any evidence that Belding ever sent in any specimen of this duck. Price (1899, p. 90, under *Aythya collaris*) saw "large flocks" of what he supposed to be this species in midwinter "at the head of the Gulf"; very doubtful.

***Olagula hyemalis* (Linnaeus)**

Old-squaw Duck

One, not quite satisfactory record: A "very peculiar duck" seen "out of gun range" near San Felipe, on the Gulf, April 1, 1926, was identified as of this species (Huey, 1927*d*, p. 20).

***Hydranassa tricolor occidentalis* Huey**

Western Louisiana Heron

A proposed new race of Louisiana Heron was described under the above name by Huey (1927*h*, p. 83), with type from Scammon Lagoon. But evidence later forthcoming appears to invalidate it. See under *Hydranassa tricolor ruficollis*, p. 84.

***Megalornis canadensis tabida* Peters**

Western Sandhill Crane

With fair likelihood, some veritable Sandhill Cranes were included in the great numbers of cranes reported as seen in the northern portion of the territory by the observers cited under *Megalornis canadensis canadensis*, p. 86. But actual specimens of *tabida* from within the Lower California boundaries are lacking to prove the point. None of the observers cited seems to have known the races apart and each followed the current usage and put the species down as *Grus mexicana*—which name is now, I think, properly to be replaced by the one used above.

Bent (1926, p. 251) includes "Colorado River delta" as within the winter range of what he calls *Megalornis canadensis mexicanus*; but I am informed by Mr. F. C. Lincoln that this ascription was based entirely upon the statements of Price and Rhoads, which I cite under *canadensis*.

***Ballus yumanensis* Dickey**

Yuma Clapper Rail

According to Bent (1926, p. 277), Mr. L. M. Huey holds the "opinion that the center of abundance of this rail is in the delta of the Colorado River." Also C. C. Lamb (MS) has found evidence of the presence of a large rail of some species at several points in the delta region. Actual specimens for definite determination appear to be as yet lacking.

***Porphyrio edwardsi* Elliot**

Edwards Moorhen

A specimen, now in the San Diego Museum of Natural History, was taken at Ensenada about December 23, 1922 (Anthony, 1923, p. 109). Doubtless an introduction, or an escape.

***Limosa lapponica baueri* Naumann**

Pacific Bar-tailed Godwit

Known only from the one most extraordinary record, of capture by Belding of a single bird at La Paz in the winter of 1882-83 (Belding, 1883b, p. 545, under the name *Limosa lapponica novae-zealandiae*; Nelson, 1921, p. 112, under *Vetola lapponica baueri*). The place of capture has been given wrongly in several publications, as "Cape St. Lucas." Brewster (1902, p. 64), by correspondence with Belding, found that the latter, when he shot the bird, was "not aware" that he "had taken anything but the common kind until Professor R[idgway]. informed" him to the contrary. Belding saved "only a head and wings," he believes. When Brewster wrote, in 1902, the head of the bird was in the National Museum, and was, he considered, "without question . . . that of an adult *L. l. baueri* in winter plumage," thus confirming Ridgway's determination. At this writing (January 24, 1927), I have before me, on loan, the head in question, which is no. 86418, U. S. Nat. Mus., as specified by Brewster. At first glance, one is impressed by the small size of the bill. But upon comparing it with a series of *Limosa fedoa*, individuals of the latter are forthcoming which are just as small, and which differ otherwise in no slightest way that I can perceive from it. Mr. H. S. Swarth, and also Mr. J. H. Riley, after independent examination of the specimen, arrive at the same conclusion as I do, namely, that it is indistinguishable from a small male of the common, to-be-expected, *fedoa*. Since it is true that *fedoa* averages decidedly longer billed, it is possible that the material available to Ridgway and to Brewster happened seemingly to exclude it from consideration as within the range of *fedoa*. On the other hand, there is the chance that the wings of the bird were saved and preserved at least until after Ridgway had examined them, and that they showed characters placing them with *baueri*. But there is no evidence now as to this; and Dr. C. W. Richmond has, at my request, kindly looked into the matter. Under all these circumstances, I see no choice but to consider the record of *Limosa lapponica baueri* somewhat in doubt, and to give it hypothetical status accordingly.

***Totanus melanoleucus frazari* Brewster**

Gray Yellow-legs

A supposed new subspecies was described by Brewster (1902, p. 65) under the above name, with type from San José del Cabo. Its tenability is now quite generally doubted on the ground that a plumage stage, or phase, is concerned rather than a geographic race. See under *Totanus melanoleucus*, p. 92.

***Phaeopus tahitiensis* (Gmelin)**

Bristle-thighed Curlew

The American Ornithologists' Union Check-list, second edition (1895b, p. 98, under the name *Numenius tahitiensis*), implies that this species is of "occasional" occurrence on the coast of Lower California; but this must have been a mistake because no mention to the same effect appears in the third edition (1910). The ascription by Sanford, Bishop and Van Dyke (1903, p. 449) to "Lower California" was due to an error in compilation, as I have been informed verbally by Dr. L. B. Bishop.

***Centrocercus urophasianus* (Bonaparte)**

Sage Hen

Given by Cooper (1870, pp. 536, 537) as "heard of" near the "boundary of Lower California." There has been no corroboration of the rumor; nor is there likely to be!

***Columba flavirostris* Wagler**

Red-billed Pigeon

Baird (in Cooper, 1870, p. 508) includes "Cape St. Lucas" within the range of this species, but without any details; and several subsequent authors repeat the ascription. Belding (1883b, p. 532, using the name *Columba erythrina*) implies that Xantus had found it, though he himself had not. Brewster (1902, p. 76) synonymizes *C. flavirostris* under *C. fasciata vioscae*, indicating that he had reason to suspect misidentification. Dr. Richmond has, at my request, searched through the collections and records in the United States National Museum without finding anything to indicate that this pigeon was ever obtained by Xantus in Lower California. I have had no opportunity to work out any further explanation of the case.

***Scardafella inca* (Lesson)**

Inca Dove

Status doubtful. Baird, Brewer and Ridgway (1874, III, p. 388) say under this heading: "Mr. Xantus found this Dove breeding abundantly at Cape St. Lucas." And they go on to describe its nesting. Even though Bendire (1892, p. 152), Salvin and Godman (1902, p. 249), and others quote this, the facts that there has been no similar finding by more recent visitors to the Cape district, and that Brewster (1902) refrains from citing the record, indicate that some error likely occurred. Furthermore, Dr. Richmond informs me that there is no record in the United States National Museum of either skins or eggs of this dove ever having been sent in from Lower California by Xantus or by anyone else. Possibly information pertaining to the Ground Dove or to the White-winged Dove was transposed under the wrong heading.

There are two other ascriptions to Lower California: Salvadori (1893, p. 466) lists a skin from La Paz, but without details. This is given credence by Ridgway (1916, pp. 391, 392). Rhoads (1905, p. 688) reports "a very few seen in the

upper Hardy river region," Colorado delta; but the well-known Ground Dove is not mentioned. Neither of these records seems to me satisfactory, save as future corroboration might be forthcoming.

Thus, despite its ascription to "Lower California" in all three editions of the A. O. U. Check-list (1886, p. 181, 1895*b*, p. 123, and 1910, p. 151), it seems best now to put this species on hypothetical status.

***Cathartes burrovianus* Cassin**

Burrough Turkey Vulture

Cassin (*in* Baird, 1858, p. 6) includes "Mazatlan, Lower California" in his formal statement of the range of this supposed species, and in the text says that it is "an inhabitant of the coasts of Mexico and Lower California." I know of no place "Mazatlan" in Lower California. Coues (1872, p. 222) expresses doubt in regard to this record; and so does Ridgway (1881, p. 83). Swann (1924, pp. 17-18) thinks it was probably based on a bird from South America, of the species now currently known as *Cathartes urubitinga*. If definitely so, then *burrovianus* should be used for that species, as it is the older name.

***Buteo borealis lucasanus* Ridgway**

San Lucas Red-tailed Hawk

Ridgway (*in* Baird, Brewer and Ridgway, 1874, III, pp. 258, 285) described, under the above name, a supposed race of red-tail thought to inhabit the peninsula of Lower California. This was recognized for a number of years, for example, in both the first and the second editions of the A. O. U. Check-list (A. O. U. Comm., 1886, p. 189, and 1895*b*, p. 131). But Brewster (1902, p. 83) showed rather conclusively that the characters assigned to "*lucasanus*" failed to hold in the large series of birds that was at his disposal. Therefore, see under *Buteo borealis calurus*, p. 108.

***Buteo platypterus* (Vieillot)**

Broad-winged Hawk

One, obviously "wild" record: Colorado delta, "two or three seen" (Rhoads, 1905, p. 689).

***Falco rusticolus gyrfalco* Linnaeus**

Common Gyrfalcon

Sharpe (1874, p. 417, under the name *Hierofalco gyrfalco*) records a "♀ juv." from the "Gulf of California" obtained through Captain Kellett. Gurney (1882, p. 586) refers to this record, and states, quite properly, that the locality is a "remarkably southern" one for the species. Indeed, this ascription is so extraordinary, and the chances so great of the confusion of data, that I consider the best procedure now is to put it in "hypothetical" status.

***Falco columbarius richardsoni* Ridgway**

Richardson Pigeon Hawk

The bird, no. 17872 in Mus. Comp. Zool., taken by Frazar, October 31, 1887, at San José del Cabo, and recorded by Brewster (1902, p. 90), though with some reservations, under the above name, turns out to be a good example of the subspecies now known as *Falco columbarius bendirei* (which see, p. 111). This conclusion was reached by both Mr. Bangs and myself after close examination of it in comparison with a large series of Pigeon Hawks. The same view was reached by Peters (1927, p. 3).

***Strix occidentalis occidentalis* (Xantus)**

California Spotted Owl

Reported as seen twice by A. W. Anthony on the western slope or base of the Sierra San Pedro Mártir: in July, 1887, "in a deep brushy cañon" at 3000 feet altitude, and in May, 1893, as "flushed from a live oak" at about 4500 feet (Bryant, 1889b, p. 284, and Anthony, 1893, p. 235, under the name *Syrnium occidentale*). Subsequent ascriptions to "northern Lower California," for example, by Oberholser (1915, p. 255), are probably based on the above records. There is also an earlier ascription, repeated, to simply "Lower California" (A. O. U. Comm., 1886, p. 199, *idem*, 1895b, p. 143, and Ridgway, 1887a, p. 259), but I do not know upon what it was based. Dr. Richmond tells me that he can find no record or specimen in the United States National Museum, of this owl from Lower California. Standing not quite secure.

***Otus asio cardonensis* Huey**

Bancroft Screech Owl

This supposed race was described by Huey (1926, p. 360) under the above name, with type from near El Rosario, latitude 30°. I have reviewed the case with some care, and come to the conclusion that satisfactory separation from *Otus asio cineraceus* (Ridgway) [which see, p. 116] is not feasible.

***Speotyto cunicularia becki* Rothschild and Hartert**

Guadalupe Burrowing Owl

A supposedly recognizable race of Burrowing Owl was named (Rothschild and Hartert, 1902, p. 405) from Guadalupe Island. But subsequent students have been unable to verify the distinctness of such a race from *Speotyto cunicularia hypugaea* (which see, p. 117).

***Glauclidium gnoma californicum* Selater**

California Pigmy Owl

Known so far only from the statement of Anthony (1893, p. 235) that two pigmy owls were seen, but not obtained, at Valladares, west base of Sierra San Pedro Mártir. While this occurrence is highly probable, it is not conclusive, and the subspecies represented is, of course, in doubt.

***Chloroceryle americana septentrionalis* (Sharpe)**

Texas Green Kingfisher

There is one circumstantial record: "La Paz, Lower California, winter (Henshaw Coll.)"—an adult female skin in the Salvin-Godman collection in the British Museum (Sharpe, 1892, p. 136, under the name *Ceryle septentrionalis*). Ridgway (1914, p. 433) cites Salvin and Godman's (1895, p. 477) ascription to "Lower California" as erroneous, but without referring to the specimen recorded by Sharpe and the existence of which may have led Salvin and Godman to make their statement, even though their citation of Baird, Brewer and Ridgway was wrong. The case is not, however, clear for giving the record full recognition, since Brewster does not mention it, and it is hard to see how the "Henshaw" collection could have come into the possession of a specimen of this kingfisher

from that alleged locality without its having been reported in some American publication. Dr. Richmond, at my request, has searched the collections and records of the United States National Museum, without finding anything pertinent to the present case. Still, Nelson (1921, p. 115) lists the genus *Chloroceryle* as "known from Lower California."

***Dryobates nuttalli longirostrata* [sic] Huey**

Desert Nuttall Woodpecker

A supposed new race named by Huey (1927d, p. 27) as above, with type from San Felipe, turns out, I find, to be *Dryobates scalaris eremicus* Oberholser (1911a, p. 151), which see, p. 121.

***Centurus chrysogenys chrysogenys* (Vigors)**

Sinaloa Golden-cheeked Woodpecker

Hargitt (1890, p. 185, under the name *Melanerpes elegans*) records three skins in the British Museum as from "La Paz, Lower California." But in a footnote: "This locality is queried upon the label." Evidently a mistake was suspected, of which now there is little doubt, considering the extreme unlikelihood of such an occurrence.

***Tyrannus tyrannus* (Linnaeus)**

Eastern Kingbird

Provisionally, rare transient or vagrant: One record: Todos Santos [lat. 23° 27'], August 3, 1924, one individual seen but not captured (Lamb, 1925d, p. 117). This is a fairly good "sight" record but, it seems to me, not quite so conclusive as if the bird had been shot and preserved.

***Otocoris alpestris insularis* C. H. Townsend**

Island Horned Lark

The specimen (now no. 14816, Dickey coll.) taken in the midwinter of 1924-25 on Natividad Island, and recorded by Lamb (1927a, p. 70) under the name *insularis* turns out to belong to the subspecies *actia*. I have examined it. See pp. 143-144.

***Otocoris alpestris pallida* Dwight**

Sonora Horned Lark

Despite its extensive employment in the literature for recording horned larks from Lower California, this name seems now to be out of commission for any of them. At one time or another it has been used for *actia*, *enertera* and *leucan-siptila*; but see under the latter, pp. 144-146.

***Icterus pustulatus* (Wagler)**

Scarlet-headed Oriole

In the British Museum Catalogue, Sclater (1886, p. 386) records an adult male in the Salvin-Godman collection as from "Cape San Lucas, Lower California (F. Gruber)." Salvin and Godman (1887, p. 477) remark: "we have a skin reputed to be from California"—probably referring to the same specimen. Gruber was a San Francisco taxidermist well known to have handled exotic bird skins in quantity. There is too much chance of a mistake in labeling to give this ascription more than hypothetical status.

***Icterus spurius* (Linnaeus)**

Orchard Oriole

The bird recorded (McLellan, 1926, p. 306) as taken on Cedros Island, June 3, 1925, is no. 27845, Calif. Acad. Sci., and turns out to be a smallish female of *Icterus cucullatus nelsoni*, which see, p. 152.

***Euphagus cyanocephalus cyanocephalus* (Wagler)**

Rocky Mountain Brewer Blackbird

Brewer Blackbirds are abundant locally in the Colorado delta in winter (see Price, 1899, p. 92, under the name *Scolecophagus cyanocephalus*, and Rhoads, 1905, p. 690). Judging from specimens taken in the Colorado River valley to the northward of the United States boundary, some, at least, of the delta-wintering birds should be of the Rocky Mountain race; but specimens of this race taken actually within the confines of Lower California are yet wanting.

***Passer domesticus domesticus* (Linnaeus)**

English House Sparrow

A recent invader across the United States boundary. Reported first by Huey (1926, p. 357) as found by him at San Antonio del Mar in April, 1923, and at Aguaita and El Rosario, in May, 1925. The latter places, close to latitude 30°, are the southernmost outposts for the species to date. Huey (1927*d*, p. 31) has also reported the species from San Felipe, on the Gulf, April 10, 1926. In the Museum of Vertebrate Zoology are specimens of the following data: San José, latitude 31°, October 19, 1925; Santo Domingo, December 12 to 31, 1925; El Valle de la-Trinidad, December 12, 1926; ten miles west of Pilot Knob and one mile south of United States boundary, March 14, 1928; seven miles east of Cerro Prieto, March 10, May 26 and June 5, 1928 (nesting here in cottonwoods far from any ranch—*fide* C. C. Lamb).

***Passerculus rostratus sanctorum* Ridgway**

San Benito Marsh Sparrow

Passerculus sanctorum was named by Ridgway (in Belding, 1883*b*, p. 538) with type from one of the San Benito Islands, and it was currently recognized, usually under the name combination as above, for many years. But Oberholser (1919*c*, p. 350), in reviewing this group of marsh sparrows, discovered that the type of Lawrence's (1867, p. 473) *Passerculus guttatus*, from San José del Cabo, is a winter-taken example of the San Benito subspecies. Therefore see, farther, under *Passerculus rostratus guttatus*, p. 163.

***Zonotrichia leucophrys nuttalli* Ridgway**

Nuttall White-crowned Sparrow

In his paper on Birds of San Pedro Mártir, Lower California, Anthony (1893, p. 241) lists all three forms of White-crowned Sparrow as occurring "about the base" of those sierra "during the winter months"; but "few specimens were taken." His name *intermedia* equals present-day *gambelii*, and his name *Zonotrichia leucophrys gambelii* equals present-day *nuttalli*. Ridgway (1901*a*, p. 342) says of *nuttalli*, "south, in winter to San Pedro Mártir Mountains," evidently

based on Anthony's reference above which he cites in the synonymy. In the Anthony collection in the Carnegie Museum, I was unable to find any *Zonotrichia* identifiable as *nuttalli*, nor do I know of any authenticated specimen of this race from anywhere else south of the United States boundary. There was evidently much confusion of ideas as to the races of White-crowns in the 1890's, and, indeed, up until Mr. Ridgway straightened them out. Even so, the A. O. U. Check-list (ed. 3, 1910, p. 262) says of *nuttalli*, "winters . . . southward to Santa Margarita Island"—based possibly on Bryant's old record of "*gambeli*" from there.

***Piranga hepatica oreophasma* Oberholser**

Arizona Hepatic Tanager

I have studied the specimen of tanager obtained September 25, 1926, near La Jolla, about 6000 feet altitude on western slope of Sierra San Pedro Mártir and recorded by Huey (1927a, p. 154) under the above name. It turns out to be *Piranga rubra rubra*, in rather unusual color of plumage. See pp. 187-188.

***Cinclus mexicanus unicolor* Bonaparte**

Northern American Dipper

Recorded from the northern end of the territory by Ridgway (1904, p. 680, and A. O. U. Comm., 1910, p. 330), but without any details. Nelson (1921, p. 131) lists this species as among those "Characteristic of the Transition Zone (San Pedro Mártir District)." But in a letter of date July 12, 1927, Dr. Nelson informs me that he now knows no definite record of the Dipper for Lower California. Moreover, he has tried to locate the origin of the ascriptions by Ridgway and the A. O. U. Committee, without avail.

***Dumetella carolinensis* (Linnaeus)**

Catbird

Thought to have been "seen and heard two or three times along the Hardy river," in the Colorado delta, in February (Rhoads, 1905, p. 690). Exceedingly doubtful.

***Toxostoma bendirei* (Coues)**

Bendire Thrasher

Listed by Nelson (1921, p. 126) as among the "Characteristic birds of the Lower Sonoran zone," "Colorado Desert district." But in a letter dated July 12, 1927, Dr. Nelson tells me that he knows of no actual occurrence of this species south of the boundary of upper California. It was included as above only on assumption.

***Toxostoma redivivum helvum* Thayer and Bangs**

El Rosario California Thrasher

This supposed subspecies, described by Thayer and Bangs (1907a, p. 17) under the name *Toxostoma rediviva helva*, with type from El Rosario, latitude 30°, I for a time considered to be a recognizable race. But after going over the whole problem again, with both upper and Lower California series of specimens before me, I find myself unable to make satisfactory separation of it from *Toxostoma redivivum redivivum*, which see (p. 210).

Salpinctes guadeloupensis proximus Swarth

San Martín Rock Wren

A supposed subspecies, based upon a single specimen from San Martín Island, was described under the above name by Swarth (1914, p. 215). The extensive material now available does not permit of separation from *Salpinctes obsoletus obsoletus* (which see, pp. 213-215).

Thryomanes bewickii carbonarius Grinnell

Sooty Bewick Wren

The race described under the above name by Grinnell (1927a, p. 72) is now designated by the earlier and applicable name *Thryomanes bewickii charienturus* of Oberholser. (See p. 216.)

Nannus hiemalis pacificus (Baird)

Western Winter Wren

Reported once. Rhoads (1905, p. 690, under the name *Troglodytes hiemalis pacificus*) lists this wren from the Colorado delta with following comment: "Two or three Wrens seen [in February] in woods near Colony were presumably this form." Exceedingly doubtful!

Baeolophus inornatus affabilis Grinnell and Swarth

San Pedro Mártir Plain Titmouse

Described as supposedly new by Grinnell and Swarth (1926d, p. 164) with type from Concepción, Sierra San Pedro Mártir. But later it was found that the subspecies must bear the prior name *Baeolophus inornatus murinus* of Ridgway. (See pp. 221-222.)

Hylocichla guttata sequoiensis (Belding)

Sierra Hermit Thrush

Said to occur "south in migration and in winter to Lower California" (A. O. U. Comm., 1910, p. 362). The only preceding published basis I can find for this is the ascription by Ridgway (1907, p. 45) to "Casa Pintada, February." But this evidently refers to the specimen taken by Belding at Casa Pintada, Sierra de la Laguna, February 17, 1883, and recorded by Brewster (1902, p. 211), upon the identification of Oberholser, as *Hylocichla guttata*. I have examined two Belding-taken skins in the U. S. National Museum (nos. 90067-68), of these data; neither is properly *sequoiensis*; both are *guttata*, subspecifically. I have personally found no example of *sequoiensis* in any collection from Lower California.

BIBLIOGRAPHY

This bibliography, containing a total of 461 titles, is intended to cover all that has been published with some measure of formality with respect to the ornithology of Lower California. As a rule, though exceptions will be found, no mention is made of narratives by non-ornithological travelers or sportsmen, or of articles in so-called popular magazines.

Every title here given has been transcribed by the present author himself, in his own hand-writing. Care has been taken to preserve exactly the original wording, spelling, and punctuation of titles. The annotations are offered with a view in most cases better to indicate the nature and value of each article than could be learned from the title alone. In a few cases, where likely to be useful to future students, comments are offered relative to the trustworthiness of the article.

It should go without saying that absolute "completeness" cannot be claimed for this bibliography. No doubt whatsoever, some titles remain overlooked, but the author hopes that these will not prove to be important ones to the main purpose of the present contribution. As is necessary in an undertaking of this sort, a final date was set beyond which no additions to this bibliography, and hence to the citations in the text, could be made. This limiting date is May 1, 1928.

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- 1884b. [Review of] Belding on birds found at Guaymas, Sonora, and in Lower California. Auk, 1, July, 1884, p. 284.
- 1884c. [Review of] Ridgway on new birds from Lower California. Auk, 1, July, 1884, pp. 284-85.
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BAIRD, S. F., BREWER, T. M., and RIDGWAY, R.

1874. A history of North American birds, land birds (Boston, Little, Brown, and Company, 1874); 1, pp. xxviii + 596 + vi, 26 pls., many figs. in text (593 in the 3 volumes); 2, pp. iv + 590 + vi, 30 pls., figs. in text; 3, pp. iv + 560 + xxviii, 8 pls., figs. in text.

Contains very many ascriptions of birds to "Cape St. Lucas," "San José" [del Cabo], or "San Nicholas," based on the Xantus collections and notes. Includes original description (3, pp. 258, 285) of *Buteo borealis*, var. *lucasanus* Ridgway.

1884. The water birds of North America (= Memoirs Mus. Comp. Zool., 12-13, Boston, Little, Brown, and Company, 1884); 2 vols.: 1, pp. xi + 537, 2, 6 + 552 pp., both vols. with numerous illus. in text.

Vol. 2 (p. 132) contains the original description of *Pelecanus californicus* Ridgway; type (p. 143) from La Paz. Otherwise, matter relating to Lower California is brief, scattering, and for the most part here unimportant for the reason that Ridgway had published it in preceding papers.

BANCROFT, G.

1922. Some winter birds of the Colorado delta. Condor, 24, May, 1922, p. 98.
Vernacular mention of about 25 species, including roseate spoonbill.

1923. Some geographical notes on the cactus wren. Condor, 25, September, 1923, pp. 165-68.

Especially concerns *Heleodytes brunneicapillus bryanti* in Lower California.

1926. The faunal areas of Baja California del Norte. Condor, 28, September, 1926, pp. 209-15, fig. 71 (map).

Mentions a few birds of critical bearing.

- 1927a. Breeding birds of Scammons Lagoon, Lower California. Condor, 29, January, 1927, pp. 29-57, figs. 13-30.

Chiefly the water birds, including certain rare herons.

- 1927b. Notes on the breeding coastal and insular birds of central Lower California. Condor, 29, July, 1927, pp. 188-95.

Some 37 species given mention, mostly water birds.

BANGS, O.

1915. The American forms of *Gallinula chloropus* (Linn.). Proc. New England Zool. Club, 5, May 17, 1915, pp. 93-99.

Florida Gallinule of Lower California referred to *Gallinula chloropus cachinnans*.

- 1907-1909, 1912. [See Thayer, J. E., and Bangs, O.]

BANGS, O., and PENARD, T. E.

1921. Notes on some American birds, chiefly Neotropical. Bull. Mus. Comp. Zool., 64, January, 1921, pp. 365-97.

Includes original description (p. 365) of *Crotophaga sulcirostris pallidula*; type from San José del Cabo.

BATCHELDER, C. F.

1890. [Review of] Bryant's 'Catalogue of the birds of Lower California.' Auk, 7, July, 1890, p. 281.

BELDING, L.

- 1883a. Catalogue of a collection of birds made at various points along the western coast of Lower California, north of Cape St. Eugenio. Proc. U. S. Nat. Mus., 5 (1882), March 21, 1883, pp. 527-32. "Edited by R. Ridgway."

From Los Coronados Islands, San Quintín Bay, Santa Rosalía Bay, and Cedros Island.

- 1883b. Catalogue of a collection of birds made near the southern extremity of the peninsula of Lower California. Proc. U. S. Nat. Mus., 5 (1882), March 21, 1883, pp. 532-50. "Edited by R. Ridgway."

According to statements by Ridgway in the footnotes, Belding lists 135 species most of which are here for the first time given published record for Lower California. However, the earlier Xantus collections in the National Museum contained specimens of many of these, as also of 34 other species not obtained by Belding. The latter are listed by Ridgway in a footnote, so that here are included, presumably, all the birds known to date from the Cape region. Ridgway supplies much critical comment upon specimens, which includes original descriptions of: *Poliophtila carulea obscura* (p. 535), type from San José [del Cabo]; and *Passerculus sanctorum* "Coues" (p. 538), type from San Benito Islands.

- 1883c. Second catalogue of a collection of birds made near the southern extremity of Lower California. Proc. U. S. Nat. Mus., 6, December 27, 1883, pp. 344-52. "Edited by R. Ridgway."

Belding here records 52 species additional to his preceding list, making a total of 187.

1887. Collecting in the Cape region of Lower California. West Am. Scientist, 3, April, 1887, pp. 93-97.

Interesting narrative, now historically valuable.

- 1889a. The humming birds of the Pacific coast north of Cape St. Lucas. West Am. Scientist, 6, September, 1889, pp. 109-10.

Ascribes the calliope hummingbird to Lower California.

- 1889b. The small thrushes of California. Proc. Calif. Acad. Sci., ser. 2, 2, October 1, 1889, pp. 57-69.

With some notes also from Lower California.

1890. Land birds of the Pacific district. Occasional Papers, 2, Calif. Acad. Sci., 1890, pp. 4+1-274.

The notes included for Lower California are scattering, and had mostly already been published by Bryant (1889b).

1900. A part of my experience in collecting. Condor, 2, January, 1900, pp. 1-5, 1 fig.

Partly in Lower California.

1903. The fall migration of *Oreortyx pictus plumiferus*. Condor, 5, January, 1903, p. 18.

With comment on *Anthus pensilvanicus* in Lower California.

BENDIRE, C. E.

1890. Notes on *Pipilo fuscus mesoleucus* and *Pipilo aberti*, their habits, nests and eggs. Auk, 7, January, 1890, pp. 22-29.

Also on *P. fuscus albicula*.

- 1892-1895. Life histories of North American birds [etc.]. = U. S. Nat. Mus., Special Bull. 1 [1892, pp. viii+446, 12 pls.] and "No. 3" [1895, pp. ix+518, 7 pls.]; 2 vols., royal 4to. [The second volume did not actually appear till October 1, 1896.]

Contains some first-hand information concerning Lower California, contributed by A. W. Anthony.

BENT, A. C.

1919. Life histories of North American diving birds = U. S. Nat. Mus., Bull. 107, 1919, pp. xiii+245, 55 pls.

Numerous Lower Californian occurrences cited in this and the following five volumes.

1921. Life histories of North American gulls and terns = U. S. Nat. Mus., Bull. 113, 1921, pp. x+345, 93 pls.

1922. Life histories of North American petrels and pelicans and their allies = U. S. Nat. Mus., Bull. 121, 1922, pp. xii+343, 69 pls.

1923. Life histories of North American wild fowl, order Anseres (Part) = U. S. Nat. Mus., Bull. 126, 1923, pp. x+250, 46 pls.

1925. Life histories of North American wild fowl, order Anseres (Part) = U. S. Nat. Mus., Bull. 130, 1925, pp. x+376, 60 pls.

1926. Life histories of North American marsh birds, orders Odontoglossae, Herodiones and Paludicolae = U. S. Nat. Mus., Bull. 135, 1926, pp. xii+490, 98 pls.

The ranges of the species include many ascriptions to localities in Lower California, some of these being here for the first time made, as based upon the field work of Nelson and Goldman.

BEBLEPSCH, H. VON.

1906. On a new form of *Oceanodroma* inhabiting San Benito Island, off the coast of Lower California. Auk, 23, April, 1906, pp. 185-86.

Oceanodroma monorhis chapmani (= *O. socorroensis*).

BISHOP, L. B.

1900. Descriptions of three new birds from Alaska. Auk, 17, April, 1900, pp. 113-20.

Critical comments (p. 116) on *Sayornis saya* from Lower California.

1903. [See Sanford, L. C., Bishop, L. B., and Van Dyke, T. S.]
 1921. Description of a new loon. *Auk*, 38, July, 1921, pp. 364-70.
 " *Gavia immer elasson* ascribed to "Lower California."
 1926. The distribution of the races of the ruby-crowned kinglet. *Condor*, 28, July, 1926, p. 183.
 Including *Regulus calendula obscurus* of Guadalupe Island.
 1927. The plumages of certain gulls. *Condor*, 29, July, 1927, pp. 201-2.
 Records *Larus argentatus* from San José del Cabo.

BOTTA, P.-E.

1835. Description du Saurothera Californiana. *Nouv. Ann. Mus. d'Hist. Nat.*, 4, 1835, pp. 121-24, pl. 9.
 "Cet oiseau existe dans toute l'étendue de la Californie depuis le cap Saint-Lucas jusqu'au port Saint-Francisco."

BOUCARD, A.

- 1892-1895. Genera of humming birds [etc.]; pp. xiv + 412. Reprinted from *The Humming Bird* (London), 2, January, 1892, to 5, December, 1895.
 Two species ascribed to Lower California: *Selasphorus rufus* (p. 8), and "*Basilinna xanthusi*" (p. 178).

BOURCIER, J.

1839. Description de quelques espèces nouvelles d'Oiseaux-Mouches. *Revue Zoologique*, 2, October, 1839, pp. 294-95.
Ornismya Costæ (p. 294), from "la Californie." Really from Magdalena Bay (see Palmer, 1918, p. 115).

BREWER, T. M.

- 1874, 1884. [See Baird, S. F., Brewer, T. M., and Ridgway, R.]

BREWSTER, W.

1881. On the affinities of certain *Polioptilæ*, with a description of a new species. *Bull. Nutt. Ornith. Club*, 6, April, 1881, pp. 101-7.
 Contains critical comments upon *P. plumbea* from the Cape region.
 1888a. Descriptions of supposed new birds from Lower California, Sonora, and Chihuahua, Mexico, and the Bahamas. *Auk*, 5, January, 1888, pp. 82-95.
 Including: *Ardea virescens frazari*, type from near La Paz; *Haematopus frazari*, type from Carmen Island; *Columba fasciata vioscae*, type from La Laguna; *Empidonax cineritius*, type from La Laguna.
 1888b. On three apparently new subspecies of Mexican birds. *Auk*, 5, April, 1888, pp. 136-39.
 Including: *Glaucidium gnoma hoskinsi*, type from Sierra de la Laguna.
 1889. Descriptions of supposed new birds from western North America and Mexico. *Auk*, 6, April, 1889, pp. 85-98.
 Including: *Empidonax griseus*, type from La Paz; *Progne subis hesperia*, type from Sierra de la Laguna.
 1890. A new subspecies of the solitary sandpiper. *Auk*, 7, October, 1890, pp. 377-79.
Totanus solitarius cinnamomeus, type from San José del Cabo.

1891. Descriptions of seven supposed new North American birds. *Auk*, 8, April, 1891, pp. 139-49.

Including: *Contopus richardsonii peninsulae*, type from Sierra de la Laguna; *Pipilo maculatus magnirostris*, type from Sierra de la Laguna; *Vireo solitarius lucasanus*, type from San José del Rancho; *Sitta carolinensis lagunae*, type from Sierra de la Laguna.

1902. Birds of the Cape region of Lower California. *Bull. Mus. Comp. Zool.*, 41, September, 1902, pp. 1-241, 1 map.

Extensively annotated list of 255 species and subspecies, with synonymies and bibliography. The most important single paper to date of its publication dealing with the ornithology of Lower California.

1903. Breeding grounds of the black and Socorro petrels.—A correction. *Auk*, 20, January, 1903, pp. 63-64.

Not found breeding by Anthony in Gulf of California.

BRYANT, H.

1861. Remarks on the variations of plumage in *Buteo borealis*, Auct., and *Buteo Harlani*, Aud.† *Proc. Boston Soc. Nat. Hist.*, 8, June, 1861, pp. 107-19.

Describes specimens of red-tailed hawk from Cape St. Lucas under the name *Buteo montanus*.

BRYANT, W. E.

1886. Cerros Island. *Forest and Stream*, 27, August 19, 1886, pp. 62-64.

An annotated formal list of 27 species of birds accompanies a spirited account of a visit to Cedros Island, in January, 1885.

- 1887a. Additions to the ornithology of Guadalupe Island. *Bull. Calif. Acad. Sci.*, 2, January 5, 1887, pp. 269-318.

More or less extensive annotations on 35 species.

- 1887b. Description of a new subspecies of petrel from Guadalupe Island. *Bull. Calif. Acad. Sci.*, 2, July 23, 1887, pp. 450-51.

Oceanodroma leucorhoa macrodactyla.

1888. Description of a new subspecies of song sparrow from Lower California, Mexico. *Proc. Calif. Acad. Sci.*, ser. 2, 1, September 29, 1888, pp. 197-200.

Melospiza fasciata rivularis, type from Comondú.

- 1889a. Descriptions of the nests and eggs of some Lower Californian birds, with a description of the young plumage of *Geothlypis beldingi*. *Proc. Calif. Acad. Sci.*, ser. 2, 2, June 20, 1889, pp. 20-24.

Relates to four species of the Cape region.

- 1889b. A catalogue of the birds of Lower California, Mexico. *Proc. Calif. Acad. Sci.*, ser. 2, 2, December 17, 1889, pp. 237-320, map.

Total of 320 species formally listed. Based not only on all previous published accounts, but also upon the author's own extensive field work and upon the manuscript notes of L. Belding and A. W. Anthony.

- 1890a. Notices of supposed new birds. *Zoe*, 1, July, 1890, pp. 148-50.

With critical comments on horned larks and verdins of Lower California.

- 1890b. An ornithological retrospect. *Zoe*, 1, December, 1890, pp. 289-93.

With comments on tameness of land birds on Guadalupe Island.

1891. The Cape region of Baja California. *Zoe*, 2, October, 1891, pp. 185-201.

Narrative account of the natural history, including mention of a good many birds.

1893. A rookery of man-o'-war birds. *Nidologist*, 1, September, 1893, pp. 1-3, 3 figs.

On Santa Margarita Island.

1894. Nesting of the osprey. *Nidologist*, 2, October, 1894, pp. 17-19, 2 figs.
On Santa Margarita and Cedros islands.

CARPENTER, N. K.

1918. An odd nest of the song sparrow of Los Coronados Islands. *Condor*, 20, May, 1918, p. 124, fig. 22.

CASSIN, J.

1863. Notes on the Picidæ. *Proc. Acad. Nat. Sci. Phila.*, November, 1863, pp. 322-28 [etc.].

Critical note (p. 328) on "*Melanerpes formicivorus*" from Xantus' Lower California collection.

1867. A third study of the Icteridæ. *Proc. Acad. Nat. Sci. Phila.*, 1867, pp. 45-74.

Icterus Parisorum (p. 54) and *Pendulinus cucullatus* (p. 60) from Lower California, as obtained by Xantus.

CHAPMAN, F. M.

1888. List of additions to the North American avifauna and of eliminations and changes in nomenclature proposed since the publication of the A. O. U. check-list. *Auk*, 5, October, 1888, pp. 393-402.

Many cases affecting Lower California.

COALE, H. K.

1914. San Lucas verdin (*Auriparus flaviceps lamprocephalus*) in California. *Auk*, 31, October, 1914, p. 543.

Very doubtful.

COLBURN, A. E.

1915. Dwarf cowbird on the Coronado Islands. *Condor*, 17, July, 1915, p. 165.

COOKE, W. W.

1904. Distribution and migration of North American warblers. = U. S. Dept. Agr., Div. Biol. Surv., Bull. 18, 1904, 142 pp.

This and the following three papers contain numerous ascriptions of species to Lower California.

1906. Distribution and migration of North American ducks, geese, and swans. = U. S. Dept. Agr., Biol. Surv., Bull. 26, 1906, 90 pp.

1910. Distribution and migration of North American shorebirds. = U. S. Dept. Agr., Biol. Surv., Bull. 35, October 6, 1910, 100 pp., 4 pls.

1915. Distribution and migration of North American gulls and their allies. = U. S. Dept. Agr., Bull. 292, October 25, 1915, 70 pp., 31 figs. in text.

Some occurrences, as established by Nelson and Goldman, here for the first time recorded.

1916. The type locality of *Brachyramphus craverii* [sic]. *Auk*, 33, January, 1916, p. 80.

Probably Isla Raza, on the Gulf side of the peninsula.

COOKMAN, A.

1923. Recent expedition to Los Coronado [*sic*] Islands, Mexico. *Oologist*, 40, November, 1923, pp. 176-78.

Unimportant mention of some birds.

1924. With the birds on Los Coronados Islands, old Mexico. *Oologist*, 41, February, 1924, pp. 22-23.

Not important.

COOPER, J. G.

1870. Ornithology of California. = Geological survey of California. | J. D. Whitney, State Geologist. | — | Ornithology. | Volume I. | Land Birds. | Edited by S. F. Baird, | from the manuscript and notes of | J. G. Cooper. | — | Published by authority of the Legislature. | 1870; pp. xii+592, many figs. in text.

The included matter relating to Lower California is entirely the work of S. F. Baird (see Cooper, 1890, p. 214), and is based on the Xantus collections. There is one new form described: *Melanerpes formicivorus*, var. *angustifrons* Baird, type from Cape St. Lucas.

1890. Note on Pacific coast birds. *Auk*, 7, April, 1890, pp. 214-16.

Explanation as to inclusion of Lower Californian species in his "Ornithology of California."

CORY, C. B.

- 1918-1919. Catalogue of birds of the Americas, Part II [No. 1, March, 1918, No. 2, December 31, 1919] = *Field Mus. Nat. Hist., Zool. Ser.*, 13, 607 pp., 2 pls.

Includes the peculiarly Lower Californian owls, nighthawks, hummingbirds, and woodpeckers.

COUES, E.-

1864. A critical review of the family Procellariidæ: *Proc. Acad. Nat. Sci. Phila.*, 1864: Part I, embracing the Procellariæ, or stormy petrels, pp. 72-91; Part II, embracing the Puffineæ, pp. 116-44.

Contains original descriptions of: *Halocyptena microsoma* (p. 79), from San José del Caba [*sic*], May, 1861, Xantus coll.; *Nectris amaurosoma* (p. 124), from Pacific Ocean near Cape St. Lucas; *Puffinus opisthomelas* (p. 139), from Cape St. Lucas.

1866. List of the birds of Fort Whipple, Arizona: with which are incorporated all other species ascertained to inhabit the Territory; with brief critical and field notes, descriptions of new species, etc. *Proc. Acad. Nat. Sci. Phila.*, March, 1866, pp. 39-100.

Includes original description (p. 76) of *Vireo pusillus*, type from Cape St. Lucas, and (p. 88, in text) of *S[isyllia]. cana*, type from Cape St. Lucas.

1868. A monograph of the Alcidiæ. *Proc. Acad. Nat. Sci. Phila.*, January, 1868, pp. 2-81, figs. 1-16.

Includes important account (p. 66) of "*Brachyrhamphus Craveri*."

1872. Key to North American birds [etc.]. Salem: Naturalists' Agency [etc.], 1872; pp. 8+361, 6 pls., 238 figs. in text.

Contains numerous ascriptions of birds to Lower California which, as then known, was the Cape district.

1897. *Ammodramus (Passerculus) sanctorum*. *Auk*, 14, January, 1897, pp. 92-93.

Critical note.

DAGGETT, F. S.

1899. Importance of accuracy in lists. Bull. Cooper Ornith. Club, 1, November, 1899, p. 115.

Critical review of W. W. Price's "Some winter birds of the lower Colorado Valley."

1903. [See Grinnell, J., and Daggett, F. S.]

DAWSON, W. L.

1923. The birds of California . . . [in four volumes paged consecutively]. South Moulton Company, San Diego, etc.; 1923 [= 1924†], pp. xviii + 2122, 1240 illustrations (in "Booklovers' Edition").

Aside from incidental ascriptions to Lower California in the statements of "general range," rather extended accounts, quoted or compiled, are given of certain water birds as nesting on Los Coronados Islands & others south of the Mexican line.

DICKEY, D. R., and VAN ROSSEM, A. J.

- 1924a. A new race of the least bittern from the Pacific coast. Bull. So. Calif. Acad. Sci., 23, February 20, 1924, pp. 11-12.

Ixobrychus exilis hesperis—ascribed to "Lower California."

- 1924b. The status of the Florida gallinule of western North America. Condor, 26, May, 1924, p. 93.

Cape San Lucas specimens are *Gallinula chloropus cachinnans*.

1925. A revisionary study of the western gull. Condor, 27, July, 1925, pp. 162-64.

Larus occidentalis wymani, here newly described, on the Pacific side of Lower California and *L. o. livens* on the Gulf side.

DWIGHT, J.

1890. The horned larks of North America. Auk, 7, April, 1890, pp. 138-58, map.

Otocoris alpestris chrysolaema and *O. a. pallida* ascribed to Lower California. The latter, credited to "Townsend, MS," is here first described but the type is not designated.

1918. The geographical distribution of color and of other variable characters in the genus *Junco*: a new aspect of specific and subspecific values. Bull. Am. Mus. Nat. Hist., 38, June 1, 1918, pp. 269-309, pls. 11-13.

Including the Lower Californian forms, which are dealt with phylogenetically in rather curious fashion.

- 1919a. Description of a new race of the western gull. Proc. Biol. Soc. Wash., 32, February 14, 1919, pp. 11-13.

Larus occidentalis livens, type from San José Island, Gulf of California.

- 1919b. A correction involving some juncos. Auk, 36, April, 1919, p. 287.

Names of some Lower Californian forms concerned.

1925. The gulls (Laridæ) of the world; their plumages, moults, variations, relationships and distribution. Bull. Am. Museum Nat. Hist., 52, December 31, 1925, pp. 63-401, pls. 11-15.

Bears upon Lower California but slightly save as regards the races of *Larus occidentalis*.

DWIGHT, J., and GRISCOM, L.

1927. A revision of the geographical races of the blue grosbeak (*Guiraca caerulea*) = Am. Mus. Novitates, No. 257, March 14, 1927, 5 pp.

Guiraca caerulea interfusa recorded from Cape San Lucas.

ELLIOT, D. G.

1879. Classification and synopsis of the Trochilidæ. = Smithsonian Contributions to Knowledge, no. 317, March, 1879, pp. xii + 277, 127 figs. in text.

Including "*Basilinna xanthusi*" (p. 227) from "Cape St. Lucas."

1895. North American shore birds [etc., 18 lines], with 74 plates [and some figs. in text]. New York, Francis P. Harper, 1895; pp. xvi + 17-268.

Hæmatopus fraseri [sic] is given a chapter (p. 210) and a "plate" (72)!

1897. The gallinaceous game birds of North America [etc., 15 lines] with forty-six plates. "Second Edition." New York, Francis P. Harper, 1897; pp. xviii + 19-220.

The "San Pedro Partridge" is given a chapter (p. 47) and a "plate" (7)!

EMERSON, W. O.

1906. *Oceanodroma leucorhoa* and its relatives on the Pacific coast. Condor, 8, March, 1906, pp. 53-55.

Including *O. kaedingi* from Lower California.

FIELD, C. L.

1925. Eggs of the elegant tern. Oologist, 62, December, 1925, pp. 158, 161. From Raza Island.

FISHER, A. K.

1920. In memoriam: Lyman Belding. Auk, 37, January, 1920, pp. 33-45, pl. 3.

With historical comment on some of the birds discovered by Belding in Lower California.

FISHER, W. K.

1905. [Biographical account of] Walter E. Bryant. Auk, 22, October, 1905, pp. 439-41.

Including his work with the birds of Lower California.

FLEMING, J. H.

1919. The Costa collection of birds. Condor, 21, January, 1919, p. 39.

Location of the type specimen of *Calypte costae*.

GAULT, B. T.

1885. Nest and eggs of *Calypte costae*. Auk, 2, July, 1885, pp. 309-11.

Quotes from Belding as to Lower Californian localities.

GAYLORD, H. A.

- 1897a. Notes from Guadalupe Island. Nidologist, 4, January, 1897, pp. 41-43. Important comment on a good many species.

- 1897b. Remarkable confidence of the Guadalupe junco. Osprey, 1, March, 1897, p. 98.

- 1897c. Notes on cormorants. Nidologist, 4, May, 1897, p. 102.

From San Gerónimo Island.

- 1897d. The American osprey in Lower California. *Osprey*, 1, June, 1897, p. 131.

Nesting on San Benito and Cedros islands.

GIFFORD, E. W.

1913. Expedition of the California Academy of Sciences to the Galapagos Islands, | 1905-1906 | VIII | The birds of the Galapagos Islands, with observations | on the birds of Cocos and Clipperton islands | (Columbiformes to Pelecaniformes). *Proc. Calif. Acad. Sci.*, ser. 4, 2, August 11, 1913, pp. 1-132, pls. 1-7.

Records from Lower Californian waters: *Sterna fuliginosa* (p. 20); *Stercorarius crepidatus* (p. 46); *Hæmatopus galapagensis*, and *H. niger* (pp. 47-53); *Sula nebouxi* (p. 93); *Phaethon æthereus* (p. 106).

GODMAN, F. D.

- 1879-1904. [See Salvin, O., and Godman, F. D.]

- 1907-1910. A monograph of the petrels (order Tubinares). Witherby & Co., London; in parts, 1907-1910, pp. lv + 381, 106 pls.

Contains full, but compiled, accounts of the Lower Californian species, with colored plates of most of them.

GOLDMAN, E. A.

1916. Plant records of an expedition to Lower California. *Contributions U. S. Nat. Herbarium*, 16, Part 14, 1916, pp. I-VIII, 309-71, IX-XIII, frontispiece (map), pls. 104-33.

Exceedingly important in its bearing on bird distribution.

1926. [See Nelson, E. W., and Goldman, E. A.]

Goss, N. S.

1888. New and rare birds found breeding on the San Pedro Martir Isle. *Auk*, 5, July, 1888, pp. 240-44.

Sula gossi and *Sula brewsteri*, here newly described, nesting; *Phaëton* [*sic*] *aethereus*, nesting. But this island is on the Sonora side of the Gulf.

1891. History of the birds of Kansas. Illustrating 529 birds. Topeka, Kansas: Geo. W. Crane & Co., Printers and Binders. 1891; 692 pp., 35 pls.

Records a few birds from northern Lower California, as observed by the author himself.

GRINNELL, J.

1901. The Monterey hermit thrush. *Auk*, 18, July, 1901, pp. 258-60.

Specimens of *Hylodictyla aoniaschkae slevini* recorded from Santa Margarita Island.

1902. [Review of] Brewster on Lower California birds. *Condor*, 4, November, 1902, pp. 147-48.

1905. Where does the large-billed sparrow spend the summer? *Auk*, 22, January, 1905, pp. 16-21.

No positive evidence available in answer.

1906. [Review of] Stone and Rhoads "On a collection of birds and mammals from the Colorado Delta, Lower California." *Condor*, 8, May, 1906, p. 78.

1908. The name of the California least vireo. *Auk*, 25, January, 1908, pp. 85-86.
Thinks that the race of California and Lower California should be called *Vireo belli albatus*.
1909. The zone-tailed hawk in California. *Condor*, 11, March, 1909, p. 69.
Also a specimen from near Tijuana, Lower California.
1918. [Review of] Robert Cushman Murphy's "Natural history observations from the Mexican portion of the Colorado Desert." *Condor*, 22, March, 1918, p. 97.
1921. The Bryant cactus wren not a bird of California. *Condor*, 23, September, 1921, p. 169.
- 1926a. A new race of the white-breasted nuthatch from Lower California. *Univ. Calif. Publ. Zool.*, 21, March 9, 1926, pp. 495-10, 1 fig.
Sitta carolinensis alexandrae, type from near La Grulla, Sierra San Pedro Mártir.
- 1926b. Occurrence of the roseate spoonbill in the Colorado Delta. *Condor*, 28, March, 1926, p. 102.
- 1926c. A new race of rufous-crowned sparrow, from north-central Lower California. *Auk*, 43, April, 1926, pp. 244-45.
Aimophila ruficeps lambi, type from Colnett.
- 1926d. Another new race of quail from Lower California. *Condor*, 28, May, 1926, pp. 128-29.
Lophortyx californica plumbea, type from San José, lat. 31°.
- 1926e. A new race of Say phoebe, from northern Lower California. *Condor*, 28, July, 1926, pp. 180-81.
Sayornis sayus quiescens; type from San José, 2500 ft. alt., lat. 31°.
- 1926f. A critical inspection of the gnatcatchers of the Californias. *Proc. Calif. Acad. Sci.*, ser. 4, 15, September 15, 1926, pp. 493-500, 1 fig. in text (map).
Includes original description (p. 497) of *Polioptila melanura abbreviata*, type from Cape San Lucas.
- 1927a. Six new subspecies of birds from Lower California. *Auk*, 44, January, 1927, pp. 67-72.
Colaptes cafer martirensis, type from La Grulla, Sierra San Pedro Mártir; *Sayornis nigricans salictaria*, type from San José, lat. 31°; *Sayornis nigricans brunnescens*, type from San José del Cabo; *Icterus cucullatus trochiloides*, type from Triunfo, lat. 23° 45'; *Amphispiza bilineata bangsi*, type from La Paz; *Thryomanes bewickii carbonarius*, type from San José, lat. 31°.
- 1927b. A proposed summation of Lower Californian ornithology. *Condor*, 29, January, 1927, pp. 76-77.
- 1927c. Designation of a Pacific coast subspecies of chipping sparrow. *Condor*, 29, January, 1927, pp. 81-82.
Spizella passerina stridula, ranging "south to and including the the Sierra San Pedro Mártir."
- 1927d. A new race of crissal thrasher, from northwestern Lower California. *Condor*, 29, March, 1927, p. 127.
Toxostoma crissale trinitatis; type from El Valle de la Trinidad, 2500 feet altitude, latitude 21° 20'.

- 1927e. A new race of Gila woodpecker from Lower California. Condor, 29, May, 1927, pp. 168-69.
Centurus uropygialis cardonensis; type from mouth of Cañón San Juan de Dios, within ten miles east of El Rosario.
- 1928a. Notes on the systematics of west American birds. I. Condor, 30, January, 1928, pp. 121-24.
Spinus pinus macropterus and *Progne subis hesperia* as races of Lower California.
- 1928b. Notes on the systematics of west American birds. II. Condor, 30, March, 1928, pp. 153-56.
Phalaenoptilus nuttallii dickeyi, new subspecies, type from San Ignacio; also critical remarks upon *Baeolophus inornatus murinus*, *Thryomanes bewickii charienturus*, and *Salpinctes obsoletus obsoletus*.

GRINNELL, J., and DAGGETT, F. S.

1903. An ornithological visit to Los Coronados Islands, Lower California. Auk, 20, January, 1903, pp. 27-37.
 Annotated list of 21 species, of which *Melospiza coronatorum* (p. 34) is described as new.

GRINNELL, J., and LAMB, C. C.

1927. New bird records from Lower California. Condor, 29, March, 1927, pp. 124-26.
 Sixteen species and subspecies from localities north of latitude 30°.

GRINNELL, J., and SWARTH, H. S.

- 1926a. Systematic review of the Pacific coast brown towhees. Univ. Calif. Publ. Zool., 21, April 6, 1926, pp. 427-33, 2 figs.
 Ranges of the four subspecies in Lower California mapped (fig. 2).
- 1926b. An additional subspecies of spotted towhee from Lower California. Condor, 28, May, 1926, pp. 130-33, figs. 37-38.
Pipilo maculatus umbraticola, type from Colnett, lat. 31°.
- 1926c. A new race of acorn-storing woodpecker, from Lower California. Condor, 28, July, 1926, pp. 176-78, fig. 48.
Balanosphyra formicivora martirensis; type from La Jolla, 6200 ft. alt., Sierra San Pedro Mártir.
- 1926d. New subspecies of birds (*Penthestes*, *Baeolophus*, *Psaltriparus*, *Chamaea*) from the Pacific coast of North America. Univ. Calif. Publ. Zool., 30, September 16, 1926, pp. 163-75, 2 figs. in text (maps).
 Includes original descriptions as follows: *Penthestes gambeli atratus*, type from La Grulla, Sierra San Pedro Mártir; *Baeolophus inornatus affabilis*, type from Concepción, Sierra San Pedro Mártir; *Psaltriparus minimus melanurus*, type from San José, lat. 31°; *Chamaea fasciata canicauda*, type from La Grulla, Sierra San Pedro Mártir.
- 1926e. Geographic variation in *Spizella atrogularis*. Auk, 63, October, 1926, pp. 475-78.
 Characterization of *S. a. cana* Coues, the type locality of which is Sierra San Gertrude, in the Cape region.

GRISCOM, L.

1926. The ornithological results of the Mason-Spinden expedition to Yucatan. Part I.—Introduction; Birds of the mainland of eastern Yucatan. = *Am. Mus. Novitates*, No. 235, November 18, 1926, 20 pp.

Contains critical comments (p. 9) on reddish egret of Lower California.

1927. [See Dwight, J., and Griscom, L.]

GURNEY, J. H.

1882. Notes on a 'Catalogue of the Accipitres in the British Museum' by R. Bowdler Sharpe (1874). *Ibis*, ser. 4, 6, 1882, pp. 579-98.

Comments (p. 586) on the record of gyrfalcon from the "Gulf of California."

HANNA, G. D.

1925. XII | Expedition to Guadalupe Island, Mexico, | in 1922 | General Report. *Proc. Calif. Acad. Sci.*, ser. 4, 14, September 5, 1925, pp. 217-75, text figs. 1-2, pls. 15-19.

A number of birds are mentioned in narrative; but apparently these are all included, and given more formal record, in Anthony's (1925) paper covering the same expedition.

HARGITT, E.

1890. Catalogue of the Picariæ in the collection of the British Museum. Scansores, containing the family Picidæ, = *Cat. Birds British Mus.*, 18, 1890, pp. xvi + 598, 15 pls., many figs. in text.

Some specimens listed from Lower California.

HARTERT, E.

1902. [See Rothschild, W., and Hartert, E.]

HASBROUCK, E. M.

1893. The geographical distribution of the genus *Megascops* in North America. *Auk*, 10, July, 1893, pp. 250-64, pls. 6a, 6b.

The name *Megascops asio trichopsis* used for all the screech owls of Lower California.

HEERMANN, A. L.

1859. Report [No. 2] upon the birds collected on the survey. Part IV of Pacific Railroad Reports, 10, 1859, pp. 29-80, 7 pls.

Contains three first-records from Lower California: *Coccyoborus caeruleus* (p. 51); *Larus heermanni* (p. 74); *Cerorhina occidentalis* (p. 75).

HEINE, F.

1863. Trochilidica. *Journ. für Ornith.*, 11, May, 1863, pp. 173-217.

Basilinna Xantusi (p. 196).

HELLMAYR, C. E.

1911. Wytman's Genera avium (Brussels): 16th Part, Fam. Sittidæ, 2 + 18 pp., 1 pl.; 17th Part, Fam. Regulidæ, 2 + 18 pp., 1 pl.; 18th Part, Fam. Paridæ, 2 + 84 pp., 3 pls. [First copies of these parts received February 21, 1912, *Adæ* C. E. H.]

Systematic revisions include the Lower Californian species of the families named.

1927. Catalogue of birds of the Americas and the adjacent islands
 "Initiated by Charles B. Cory" "Continued by Charles E. Hellmayr" Part V, Tyrannidae = Field Mus. Nat. Hist., Zool. Ser., 13, April 11, 1927, pp. vi+517.

Contains important critical comments on certain flycatchers of Lower California.

HOLTERHOFF, G.

1884. *Calamospiza bicolor* in southern California. Auk, 1, July, 1884, p. 293.

Also in Lower California, on authority of Belding.

HOWE, R. H.

1901. A study of the genus *Macrorhamphus*. Auk, 18, April, 1901, pp. 157-62, map.

M. griseus ascribed to Lower California.

HOWELL, A. B.

1910. Notes from Los Coronados Islands. Condor, 12, November, 1910, pp. 184-87, figs. 57-58.

On Xantus murrelet, duck hawk, etc.

1911. Some birds of the San Quentin Bay region, Baja California [*sic*]. Condor, 13, September, 1911, pp. 151-53, and 211 (correction).

Some 58 species named in a running account.

1912. Notes from Todos Santos Islands. Condor, 14, September, 1912, pp. 187-91.

On 32 species of birds.

1917. Birds of the islands off the coast of southern California. = Pacific Coast Avifauna No. 12, June 30, 1917, 127 pp., map.

Including Los Coronados Islands, from which 58 species are recorded.

1920. Habits of *Oceanodroma leucorhoa beali* versus *O. socorroensis*. Condor, 22, January, 1920, pp. 41-42.

The latter as observed on Los Coronados Islands.

1923. The influences of the southwestern deserts upon the avifauna of California. Auk, 40, October, 1923, pp. 584-92.

Bird life of Lower California also affected, especially as to annual migrations.

HUEY, L. M.

- 1924a. Notes from southern and Lower California. Condor, 26, March, 1924, pp. 74-75.

Sula brewsteri near San Benito Islands.

- 1924b. A trip to Guadalupe, the isle of my boyhood dreams. Natural History, 24, 1924, pp. 578-88.

Contains important information as to present status of the avifauna of that island.

- 1925a. Unpublished San Diego records. Condor, 27, March, 1925, p. 72.

Oceanodroma homochroa breeding on "the Coronado Islands."

- 1925b. Guadalupe Island: an object lesson in man-caused devastation. Science, 61, April 17, 1925, pp. 405-7.

Chiefly mammalogical, but refers in a general way to the disappearance of bird life.

1926. Notes from northwestern Lower California, with the description of an apparently new race of the screech owl. *Auk*, 63, July, 1926, pp. 347-62, map.
Ninety-four species formally listed. *Otus asio cardonensis* (p. 360) described as new; type from Cañón San Juan de Dios, about ten miles east of El Rosario.
- 1927a. Additional bird records from Lower California. *Condor*, 29, May, 1927, pp. 153-54.
Relates to 23 species from the northwestern portion of the territory, some of them "first" records.
- 1927b. A Pacific coast race of the yellow-crowned night heron. *Condor*, 29, May, 1927, pp. 167-68.
Nyctanassa violacea bancrofti, type from Scammon Lagoon.
- 1927c. A discussion of the zonal status of the Sierra San Pedro Martir, Lower California, Mexico, with descriptions of a new kangaroo rat and a new woodpecker from that region. *Trans. San Diego Soc. Nat. Hist.*, 5, "February 20" [= July 6], 1927, pp. 3-10, pl. 1.
Original description (p. 9) of *Dryobates villosus scrippsae*; type from La Grulla, 7500 feet altitude.
- 1927d. Birds recorded in spring at San Felipe, northeastern Lower California, Mexico, with the description of a new woodpecker from that locality. *Trans. San Diego Soc. Nat. Hist.*, 5, July 14, 1927, pp. 13-40, pls. 2-3.
A list of 90 species, of which *Dryobates nuttallii longirostrata* [sic] is described as new; type from San Felipe. *Gavia stellata* and *Clangula hyemalis* are for the first time credited to Lower California. Some of the "sight" records are not conclusive, though the list as a whole is an important one.
- 1927e. Northward migration of Pacific loons. *Condor*, 29, July, 1927, p. 202.
At San Roque Bay.
- 1927f. Northernmost breeding station of the Heermann gull on the Pacific Ocean, and other notes from San Roque Island, Lower California. *Condor*, 29, July, 1927, pp. 205-6.
Eleven species mentioned.
- 1927g. The bird life of San Ignacio and Pond lagoons on the western coast of Lower California. *Condor*, 29, September, 1927, pp. 239-43.
A total of 57 species mentioned.
- 1927h. A new Louisiana heron and a new round-tailed ground squirrel from Lower California, Mexico. *Trans. San Diego Soc. Nat. Hist.*, 5, October 10, 1927, pp. 83-86.
Hydranassa tricolor occidentalis (p. 83), type from Scammon Lagoon.
- 1927i. Observations on the spring migration of *Aphriza* and *Gavia* in the Gulf of California. *Auk*, 64, October, 1927, pp. 529-31.
Repeats previously made records (Huey, 1927d, p. 24, and Huey, 1927e, p. 202).
- 1927j. Where do birds spend the night? *Wilson Bull.*, 39, December, 1927, pp. 215-17.
Some of the facts gathered in Lower California.
- 1928a. Some bird records from northern Lower California. *Condor*, 30, March, 1928, pp. 158-59.
From Ojos Negros, El Valle de la Trinidad and Laguna Hanson.

KAEDING, H. B.

1897. In Mexican waters. Success of the Anthony-Kaeding-McGregor expedition. *Nidologist*, 4, May, 1897, p. 109.

News note, with brief mention, in the vernacular, of birds found on San Martín and Natividad islands.

1905. Birds from the west coast of Lower California and adjacent islands. *Condor*, 7, 1905, July, pp. 105-11, September, pp. 134-38.

A total of 167 species listed; but some of these ascriptions pertain to the Revillagigedo group of islands and these islands are not in my paper considered as part of Lower California.

KIMBALL, H. H.

1922. Bird records from California, Arizona, and Guadalupe Island. *Condor*, 24, May, 1922, pp. 96-97.

From latter locality: *Zonotrichia albicollis* and *Piranga rubra rubra*.

LAMB, C. C.

1909. Nesting of the *Xantus murrelet* as observed on Los Coronados Islands, Lower California. *Condor*, 11, January, 1909, pp. 8-9.

1910. A glimpse of bird life on the west coast of Mexico. *Condor*, 12, March, 1910, pp. 74-79.

With comments on a few species seen off the west coast of Lower California.

- 1923a. In Lower California. *Oologist*, 60, June, 1923, pp. 102-3.

Contains short list of birds observed in San José del Cabo.

- 1923b. A newsy letter. *Oologist*, 60, August, 1923, pp. 142-43.

With brief mention of some birds of the Cape district of Lower California.

1924. Lower California notes. *Oologist*, 61, June, 1924, p. 63.

Informal comment on birds met with on Ildefonso Island.

- 1925a. The Socorro warbler added to the A. O. U. check-list. *Condor*, 27, January, 1925, pp. 36-37.

Three occurrences, in vicinity of Todos Santos (about lat. 23° 27').

- 1925b. Natividad Island. *Oologist*, 62, March, 1925, p. 43; *idem*, November, 1925, p. 149 (photo).

Brief note on black-vented shearwater, with picture of same at nesting burrow.

- 1925c. Observations on the *Xantus* hummingbird. *Condor*, 27, May, 1925, pp. 89-92, fig. 21.

Nesting habits in the Sierra de la Laguna and at Comondú.

- 1925d. Some birds new to the Cape San Lucas region. *Condor*, 27, May, 1925, pp. 117-18.

Notes on twelve species.

1926. The Viosca pigeon. *Condor*, 28, November, 1926, pp. 262-63.

As nesting in the Laguna Mountains.

- 1927a. The birds of Natividad Island, Lower California. *Condor*, 29, January, 1927, pp. 67-70.

An annotated list of 49 species.

- 1927b. Notes on some birds of the southern extremity of Lower California. Condor, 29, May, 1927, pp. 155-57.
Relates to forty species.
1927. [See Grinnell, J., and Lamb, C. C.]

LAWRENCE, G. N.

- 1860a. Descriptions of three new species of hummingbirds of the genera *Helio-*
master, *Amazilia*, and *Mellisuga*. Annals Lyc. Nat. Hist. New York,
7, April, 1860, pp. 107-11.
Original description of *Amazilia xantusii*, from "Cape St.
Lucas."
- 1860b. Description of a new species of bird of the genus *Phaeton*, also of a
new species of humming bird of the genus *Heliopaedica*. Annals
Lyc. Nat. Hist. New York, 7, April, 1860, pp. 142-145.
Heliopaedica castaneocauda [= male of *Amazilia xantusii*, pre-
viously named], from "Cape St. Lucas."
1867. Descriptions of new species of American birds. Annals Lyc. Nat.
Hist. New York, 8, May, 1867, pp. 466-82.
Including *Passerculus guttatus* (p. 473); type from San José
[del Cabo].

LICHTENSTEIN, H.

1839. Beitrag zur ornithologischen Fauna von Californien nebst Bemerkungen
über die Artkennzeichen der Pelicane und über einige Vögel von
den Sandwich-Inseln. Abh. K. Akad. Wiss. Berlin (Physik.-math.
Kl.), 1838 [1839], pp. 417-51, pls. 1-5.
While the collector-merchant, F. Deppe, is said to have traversed
the whole length of "old" as well as parts of "new" California,
I can find no reference of any bird definitely to the former (that is,
to Lower as distinguished from upper California), save that hum-
mingbirds and ravens are mentioned in the narrative.

LUCAS, F. A.

1891. Some bird skeletons from Guadalupe Island. Auk, 8, April, 1891,
pp. 218-22.
Reflect loss in wing power.

MAILLIARD, J.

1923. Expedition of the California Academy of Sciences to the Gulf of Cali-
fornia in 1921 | The birds. Proc. Calif. Acad. Sci., ser. 4, 12,
August 21, 1923, pp. 443-56.
A short list of species more or less certainly identified, with
meager annotations.

MALHERBE, A.

1852. Description de nouvelles espèces de Picidæ. Revue et Magasin de
Zoologie, 4, 1852, pp. 550-55.
Geopicus (*Colaptes*, Sw.) *chrysoïdes* newly described (p. 553),
but with no more exact locality designated here than America.
- 1861-1862. Monographie des Picidées [etc.]. Metz, Société d'Histoire
naturelle de la Moselle; 1, 1861, 214 pp.; 2, 1862, 325 pp.; 3, 4,
121 pls.
Recorded definitely from Lower California: *Picus lucasanus* (1,
p. 166); *Geopicus chrysoïdes* (2, p. 261, pl. 109).

MCGREGOR, R. C.

1897. Nest and eggs of the San Benito sparrow. *Osprey*, 2, November, 1897, p. 42.
 With comments, also, upon several other birds of the San Benito Islands.
- 1898a. The Guadalupe house finch. *Osprey*, 2, February-March, 1898, pp. 80-81.
 Brief account of habits.
- 1898b. Notes on the occurrence of the red and northern phalaropes at Santa Cruz, Cal. *Osprey*, 2, February-March, 1898, pp. 87-88, 4 figs.
 Occurrences in Lower California also.
- 1898c. Young plumages of Mexican birds. *Auk*, 15, July, 1898, pp. 264-65.
Ammodramus sanctorum and *Carpodacus mcgregori* from Lower California.
- 1898d. Description of a new *Ammodramus* from Lower California. *Auk*, 15, July, 1898, pp. 265-67.
A. halophilus, type from Abreojos Point.
- 1899a. Protective coloration. *Bull. Cooper Ornith. Club*, 1, January, 1899, p. 16.
 Relates to *Cardinalis* and *Pyrrhuloxia* at San José del Cabo.
- 1899b. A new station for the Mexican crossbill. *Osprey*, 3, May, 1899, p. 141.
 On Cedros Island.
- 1899c. Notes on California song sparrows. *Bull. Cooper Ornith. Club*, 1, September, 1899, pp. 87-88.
 Birds from Los Coronados Islands referred to *Melospiza melodia clementae*.
- 1899d. The duck hawk in Lower California. *Oologist*, 16, November, 1899, pp. 181-82, 1 fig.
 As nesting on San Gerónimo, the San Benito, and Natividad islands.
1901. Dichromatism in the genus *Carpodacus*. *Condor*, 3, January, 1901, pp. 13-14.
 Especially in the races of Lower California.

MCLELLAN, M. E.

1926. XI | Expedition to the Revillagigedo Islands, | Mexico, in 1925, VI |
 The birds and mammals. *Proc. Calif. Acad. Sci.*, ser. 4, 15, May 20, 1926, pp. 279-322.
 Includes records of birds taken at several of the islands and two mainland points along the western side of the Lower Californian peninsula. The occurrences of most interest, perhaps, pertain to Alijos Rocks, latitude 25°.

MEARNS, E. A.

1890. Descriptions of a new species and three new subspecies of birds from Arizona. *Auk*, 7, July, 1890, pp. 243-51.
 With critical comment on *Melanerpes formicivorus angustifrons*.
1892. A study of the sparrow hawks (subgenus *Tinnunculus*) of America, with especial reference to the continental species (*Falco sparverius* Linn.). *Auk*, 9, July, 1892, pp. 252-70.
 New subspecies (p. 267): *F. s. peninsularis*, type from San José [del Cabo].

1895. Description of a new heron (*Ardea virescens anthonyi*) from the arid region of the interior of North America. *Auk*, 12, July, 1895, pp. 257-59.
Type from Seven Wells, Salton River, south of monument no. 213, Mexican boundary.
- 1902a. Two subspecies which should be added to the check-list of North American birds. *Auk*, 19, January, 1902, pp. 70-72.
Mimus polyglottos leucopterus ascribed to "all of Lower California."
- 1902b. The cactus wrens of the United States. *Auk*, 19, April, 1902, pp. 141-45.
Heleodytes brunneicapillus affinis, *H. b. bryanti*, and *H. b. anthonyi* (new subspecies, type from San Telmo) ascribed to Lower California.
1907. Mammals of the Mexican boundary of the United States [etc.] = U. S. Nat. Mus., Bull. 56, 1907, pp. xvi + 530, 13 pls., 120 figs. in text.
Under "Descriptions of principal collecting stations" are explicit designations of the places along the Lower Californian boundary where birds were obtained (see pp. 129-136). The birds collected, however, are not specified here, save for informal mention, but have been partly recorded by several other authors who have made use of the collections in the United States National Museum.

MERRIAM, C. H.

1892. The geographic distribution of life in North America with special reference to the Mammalia. *Proc. Biol. Soc. Wash.*, 7, April, 1892, pp. 1-64.
In treating of the faunal relationships of Lower California (pp. 16, 28-30) a few birds are cited.
1893. The faunal position of Lower California. *Auk*, 10, July, 1893, pp. 305-7.
Critical comments on J. A. Allen's paper of same year, with reply by Allen.

MEINERTZHAGEN, R.

1926. Introduction to a review of the genus *Corvus*. *Novitates Zoologicae*, 33, October, 1926, pp. 57-121, pls. 1-12.
Lower California designated as within the range of *Corvus corax sinuatus*, of which the name *clarionensis* becomes a synonym.

MILLER, W. DE W.

1915. *Corthylio*—A valid genus for the ruby-crowned kinglet. *Auk*, 32, April, 1915, pp. 234-36.
Includes critical comment upon *Corthylio obscurus* of Guadalupe Island.
1919. Constant difference in relative proportions of parts as a specific character. *Auk*, 36, April, 1919, pp. 295-96.
As applied to Guadalupe Island rock wren.

MURPHY, R. C.

1917. Natural history observations from the Mexican | portion of the Colorado Desert | with a note on the Lower Californian pronghorn and a | list of the birds. Abstract Proc. Linn. Soc. New York, nos. 24-25, 1917, pp. 43-101, pls. 1-6.

The list of birds numbers 134 formal entries; but unfortunately many of these are based upon the sight records of Rhoads, a considerable part of which are questionable.

1925. Notes on certain species and races of oyster-catchers. Am. Mus. Novitates, no. 194, November 17, 1925, pp. 1-15.

Haematopus palliatus frazari dealt with critically.

NELSON, E. W.

- 1904a. *Empidonax griseus* Brewst. = *E. canescens* Salv. & Godm. Auk, 21, January, 1904, p. 80.

Nomenclatural.

- 1904b. A revision of the North American mainland species of *Myiarchus*. Proc. Biol. Soc. Wash., 17, March 10, 1904, pp. 21-50, 1 fig.

Gives critical attention to the two forms from Lower California.

1907. *Empidonax griseus* Brewster vs. *Empidonax canescens* Salvin and Godman. Auk, 24, January, 1907, pp. 99-100.

First name has priority.

1921. Lower California and its natural resources. = National Acad. Sci., 16, First Memoir, [June?] 1921, 194 pp., 35 pls. (three of them maps).

Contains lists of birds for each of the life-zones in the several districts. Important for its excellent descriptions of localities.

NELSON, E. W., and GOLDMAN, E. A.

1926. A. Mexico and Central America. Section 3. The tropics north of the equator. B. Natural regions and natural areas. Naturalist's guide to the Americas (The Williams & Wilkins Company, Baltimore, 1926, xvi + 761 pp., frontispiece, 16 figs. in text), pp. 574-96, fig. 13.

Includes Lower California, and gives lists of birds distinctive of the different major life-zones and associations. Essentially the same, to this extent, as in Nelson's main work (1921).

NORDHOFF, C. B.

1922. Notes on some water-fowl. Condor, 24, March, 1922, pp. 64-65.

Canabal duck noted as occurring on lakes of the San Pedro Mártir Mountains.

NORRIS, J. P.

1886. Eggs of the St. Lucas cactus wren. Ornithologist and Oologist, 11, February, 1886, pp. 20-21.

1887. Bryant's "Additions to the ornithology of Guadalupe Island." Ornithologist and Oologist, 12, April, 1887, pp. 52-54.

Extended synoptical review.

NORTH, A. W.

1910. Camp and camino in Lower California—a record of the adventures of the author while exploring peninsular California, Mexico (The Baker & Taylor Co., New York); 8vo., 346 pp., map, 29 photographic illus.

Various birds are mentioned in passing, notably the California condor (pp. 26, 271).

OBERHOLSER, H. C.

- 1897a. Critical remarks on *Cistothorus palustris* (Wils.) and its western allies. Auk, 14, April, 1897, pp. 186–96.

C. p. plesius recorded from Lower California.

- 1897b. Critical notes on the genus *Auriparus*. Auk, 14, October, 1897, pp. 390–94.

Original description of *Auriparus flaviceps lamprocephalus*, type from "Cape St. Lucas."

1898. A revision of the wrens of the genus *Thryomanes* Selater. Proc. U. S. Nat. Mus., 21, November 19, 1898, pp. 421–50.

Three of the forms from Lower California; one of them, *T. bewickii charienturus*, new, with type from Nachoguero Valley.

- 1899a. Description of a new *Hylocichla*. Auk, 16, January, 1899, pp. 23–25.

Records *Hylocichla ustulata oedica* from definite localities in Lower California.

- 1899b. Description of a new *Geothlypis*. Auk, 16, July, 1899, pp. 256–58.

G. trichas arizela recorded from three localities in Lower California.

- 1899c. A synopsis of the genus *Contopus* and its allies. Auk, 16, October, 1899, pp. 330–37.

Some ranges include Lower California.

1902. A review of the larks of the genus *Otocoris*. Proc. U. S. Nat. Mus., 24, June 9, 1902, pp. 801–83, pls. 43–45, maps 1–4.

Three races ascribed to Lower California.

- 1903a. A review of the genus *Catherpes*. Auk, 20, April, 1903, pp. 196–98.

Catherpes mexicanus polioptilus, here newly named, ascribed to Lower California.

- 1903b. A synopsis of the genus *Psaltiriparus*. Auk, 20, April, 1903, pp. 198–201.

P. grindae and *P. minimus californicus* ascribed to Lower California.

- 1903c. The North American forms of *Astragalinus psaltria* (Say). Proc. Biol. Soc. Wash., 16, September 30, 1903, pp. 113–16.

A. p. hesperophilus, alone, ascribed to Lower California.

1904. A revision of the American great horned owls. Proc. U. S. Nat. Mus., 27, January 22, 1904, pp. 177–92.

Two races from Lower California.

1905. The forms of *Vermivora celata* (Say). Auk, 22, July, 1905, pp. 242–47.

V. c. orestera (new subspecies) and *V. c. lutescens* recorded from Lower California.

1907. Description of a new *Otocoris* from Lower California. Proc. Biol. Soc. Wash., 20, March 27, 1907, pp. 41–42.

Otocoris alpestris enclertera, type from Llano de Yrais (near Magdalena Bay).

- 1911a. A revision of the forms of the ladder-backed woodpecker (*Dryobates scalaris* [Wagler]). Proc. U. S. Nat. Mus., 41 (1912), June 30, 1911, pp. 139-59, pl. 12 (map).
Includes original description of *D. s. eremicus*, type from San Fernando.
- 1911b. A revision of the forms of the hairy woodpecker (*Dryobates villosus* [Linnaeus]). Proc. U. S. Nat. Mus., 40 (1911), June 3, 1911, pp. 595-621, pl. 70 (map).
D. v. hyloscopus in Lower California.
- 1912a. A revision of the subspecies of the green heron (*Butorides virescens* [Linnaeus]). Proc. U. S. Nat. Mus., 42 (1912), August 29, 1912, pp. 529-77.
B. v. frazari and *B. v. anthonyi* from Lower California.
- 1912b. A revision of the forms of the great blue heron (*Ardea herodias* Linnaeus). Proc. U. S. Nat. Mus., 43 (1913), December 12, 1912, pp. 531-59.
A. h. treganzai and *A. h. sanctilucae* ascribed to Lower California.
1914. A monograph of the genus *Chordeiles* Swainson, type of a new family of goatsuckers. = U. S. Nat. Mus., Bull. 86, April 6, 1914, pp. viii + 123, 6 pls.
Includes original description of *Chordeiles acutipennis inferior* (p. 109), type from Triunfo.
1915. Critical notes on the subspecies of the spotted owl, *Strix occidentalis* (Xantus). Proc. U. S. Nat. Mus., 49 (1916), July 26, 1915, pp. 251-57.
S. o. occidentalis ascribed to "northern Lower California."
- 1917a. Notes on North American birds. II. Auk, 34, July, 1917, pp. 321-29.
Several of Lower California.
- 1917b. Notes on North American birds. III. Auk, 34, October, 1917, pp. 465-70.
On *Sula dactylatra californica* (p. 467) and *Fregata minor palmerstoni* (p. 469), as affecting Lower California.
- 1917c. Notes on the Genus *Puffinus* Brisson. Auk, 34, October, 1917, pp. 471-75.
Includes critical comments upon *P. auricularis* and *P. opisthomelas* as occurring in Lower California.
- 1917d. A review of the subspecies of the Leach petrel, *Oceanodroma leucorhoa* (Vieillot). Proc. U. S. Nat. Mus., 54, October 19, 1917, pp. 165-72.
O. l. kaedingi off western coast of Lower California.
- 1917e. A new subspecies of *Geothlypis beldingi*. Condor, 19, November, 1917, pp. 182-84.
G. beldingi goldmani, type from San Ignacio.
- 1918a. A revision of the races of *Toxostoma redivivum* (Gambel). Auk, 35, January, 1918, pp. 52-61.
T. r. redivivum and *T. r. helvum* ascribed to Lower California.
- 1918b. New light on the status of *Empidonax traillii* (Audubon). Ohio Jour. Sci., 18, January, 1918, pp. 85-98.
Specimens of *E. t. brewsteri*, here newly named, listed from Lower California.
- 1918c. Notes on the subspecies of *Numenius americanus* Bechstein. Auk, 35, April, 1918, pp. 188-95.
Records from Lower California.

- 1918d. Third annual list of proposed changes in the A. O. U. check-list of North American birds. Auk, 35, April, 1918, pp. 200-17.
Several affecting Lower California.
- 1918e. The common ravens of North America. Ohio Jour. Sci., 18, April, 1918, pp. 213-25.
Ravens from Lower California all referred to *Corvus corax clarionensis*.
- 1918f. Notes on North American birds. VI. Auk, 35, October, 1918, pp. 463-67.
Dendroica coronata hooveri recorded (p. 466) from "southern Lower California."
- 1918g. The range and status of *Aphelocoma californica hypoleuca* Ridgway. Auk, 35, October, 1918, pp. 480-81.
Proved to intergrade with *A. c. obscura*.
- 1918h. Description of a new *Lanius* from Lower California. Condor, 20, November, 1918, pp. 209-10.
Lanius ludovicianus nelsoni, type from Todos Santos.
- 1919a. Notes on North American birds. VII. Auk, 36, January, 1919, pp. 81-85.
Name of mangrove warbler becomes (p. 85) *Dendroica erithachorides castaneiceps*.
- 1919b. Fourth annual list of proposed changes in the A. O. U. check-list of North American birds. Auk, 36, April, 1919, pp. 266-73.
Several affecting Lower California.
- 1919c. A revision of the subspecies of *Passerculus rostratus* (Cassin). Ohio Jour. Sci., 19, April, 1919, pp. 344-54.
The breeding ranges in Lower California defined.
- 1919d. Description of an interesting new junco from Lower California. Condor, 21, May, 1919, pp. 119-20.
Junco oreganus pontilis, from "Hanson Laguna Mountains."
- 1919e. *Aechmophorus occidentalis* in Lower California in summer. Condor, 21, May, 1919, p. 128.
At Volcano Lake.
- 1919f. Notes on North American birds. VIII. Auk, 36, July, 1919, pp. 406-8.
Comments on status of Guadalupe Island rock wren.
- 1919g. The geographic races of *Hedymeles melanocephalus* Swainson. Auk, 36, July, 1919, pp. 408-16.
H. m. melanocephalus from "northeastern Lower California."
- 1919h. Description of another new subspecies of *Lanius ludovicianus*. Wilson Bull., 31, September, 1919, pp. 87-90.
L. l. grinnelli, type from San Fernando.
- 1919i. Description of a new subspecies of *Pipilo fuscus*. Condor, 21, September, 1919, pp. 210-11.
Pipilo fuscus aripolius, type from San Pablo.
- 1919j. Notes on North American birds. IX. Auk, 36, October, 1919, pp. 556-59.
On name of red-tailed tropic-bird (p. 557).
- 1920a. A synopsis of the genus *Thryomanes*. Wilson Bull., 32, March, 1920, pp. 18-28.
Three subspecies ascribed to Lower California.

- 1920b. Fifth annual list of proposed changes in the A. O. U. check-list of North American birds. *Auk*, 37, April, 1920, pp. 274-85.
Several affecting Lower California.
- 1921a. Sixth annual list of proposed changes in the A. O. U. check-list of North American birds. *Auk*, 38, April, 1921, pp. 264-69.
One affecting Lower California.
- 1921b. A revision of the races of *Dendroica auduboni*. *Ohio Jour. Sci.*, 21, May, 1921, pp. 240-48.
Both *D. a. auduboni* and *D. a. memorabilis* (here newly named), recorded from localities in Lower California.
- 1922a. Notes on North American birds. XI. *Auk*, 39, January, 1922, pp. 72-78.
Critical comment (p. 76) on the shrikes of Lower California.
- 1922b. Seventh annual list of proposed changes in the A. O. U. check-list of North American birds. *Auk*, 39, April, 1922, pp. 243-49.
One affecting Lower California.
- 1923a. Notes on the forms of the genus *Oreortyx* Baird. *Auk*, 40, January, 1923, pp. 80-84.
Critical comments on *Oreortyx picta confinis*.
- 1923b. Eighth annual list of proposed changes in the A. O. U. check-list of North American birds. *Auk*, 40, October, 1923, pp. 677-82.
Some affecting Lower California.
1924. Ninth annual list of proposed changes in the A. O. U. 'Check-list' of North American birds. *Auk*, 41, October, 1924, pp. 590-95.
Some affecting Lower California.

OGILVIE-GRANT, W. R.

- 1892, 1898. [See Sharpe, R. B., and Ogilvie-Grant, W. R.]

OSBURN, P. I.

1909. Notes on the birds of Los Coronados Islands, Lower California. *Condor*, 11, July, 1909, pp. 134-38, 1 fig.
On 34 species.
1911. Collecting Socorro and black petrels in Lower California. *Condor*, 13, January, 1911, pp. 31-34, figs. 16-17.
On Los Coronados Islands.

PALMER, T. S.

1918. Costa's hummingbird—its type locality, early history and name. *Condor*, 20, May, 1918, pp. 114-16.
Shows that Magdalena Bay was the type locality of *Calypste costae*.

PALMER, W.

1896. A note on *Buteo borealis lucasanus* Ridgway. *Auk*, 13, October, 1896, p. 342.

PENARD, T. E.

1921. [See Bangs, O., and Penard, T. E.]

PETERS, J. L.

1923. A new quail from Lower California. Proc. New England Zool. Club, 8, May 16, 1923, pp. 79-80.

Lophortyx californica achrustera, type from La Paz.

1927. The North American races of *Falco columbarius*. Bull. Essex Co. Ornith. Club for 1926 (issued May 9, 1927), 8 pp. [separate].

PHILLIPS, J. C.

- 1922-1926. A natural history of the ducks (Houghton Mifflin Company, Boston and New York); 1, 1922, pp. xii + 264, 18 pls., 27 maps; 2, 1923, pp. xii + 409, 26 pls., 38 maps; 3, 1925, pp. xii + 383, 26 pls., 30 maps; 4, 1926, pp. xii + 489, 32 pls., 23 maps.

Under "Distribution," known Lower Californian occurrences are mostly covered.

PRICE, W. W.

1899. Some winter birds of the lower Colorado Valley. Bull. Cooper Ornith. Club, 1, September, 1899, pp. 89-93.

An annotated list of 91 species, mostly from below Yuma either in Sonora or Lower California—just which, is doubtful in many cases. Also a considerable number of the determinations are doubtful, for the reason that very few specimens were preserved—none at all of most of the species.

RHODES, S. N.

1893. The *Vireo huttoni* group, with description of a new race from Vancouver Island. Auk, 10, July, 1893, pp. 238-41.

V. h. stephensi is the name applied to the race of southern Lower California.

1905. [See Stone, W., and Rhoads, S. N.]

RICHMOND, C. W.

1902. *Toxostoma* vs. *Harporyhynchus*. Auk, 19, January, 1902, p. 89.

Nomenclatural.

RIDGWAY, R.

1873. On the relation between color and geographical distribution in birds, as exhibited in melanism and hyperchromism. Am. Jour. Sci. and Arts, ser. 3, 5, 1873, pp. 39-44.

Including *Carpodacus* and *Cardinalis* of Lower California.

1874. [See Baird, S. F., Brewer, T. M., and Ridgway, R.]

- 1876a. Studies of the American Falconidæ. Monograph of the Polybori. U. S. Geol. and Geog. Surv. Terr., 1, February 8, 1876, pp. 451-73, pls. 22-26.

Original description (p. 459) of *Polyborus lutosus* from Guadalupe Island.

- 1876b. Ornithology of Guadalupe Island, based on notes and collections made by Dr. Edward Palmer. Bull. U. S. Geol. and Geog. Surv. Terr., 2, 1876 [April 1], pp. 183-95.

Eight species of land birds definitely recorded, seven of which are here newly named: *Regulus calendula obscurus*, *Salpinctes obsoletus guadeloupensis*, *Thryomanes brevicauda*, *Carpodacus amplus*, *Junco insularis*, *Pipilo maculatus consobrinus*, and *Colaptes mexicanus rufipileus*.

1877. The birds of Guadalupe Island, discussed with reference to the present genesis of species. Bull. Nuttall Ornith. Club, 2, July, 1877, pp. 58-66.
The eight peculiar land species given analytical attention.
1881. Nomenclature of North American birds chiefly contained in the United States National Museum. = U. S. Nat. Mus., Bull. 21, 1881, 94 pp.
The Appendix (pp. 59-85) cites many Lower Californian occurrences.
- 1882a. On two recent additions to the North American bird-fauna, by L. Belding. Proc. U. S. Nat. Mus., 4 (1881), April 24, 1882, pp. 414-15.
Motacilla ocularis and *Dendroica vieillotii bryanti*.
- 1882b. Descriptions of some new North American birds. Proc. U. S. Nat. Mus., 5, September 5, 1882, pp. 343-46.
Including *Geothlypis beldingi*, type from San José del Cabo; *Rallus beldingi*, type from Espíritu Santo Island.
- 1883a. On the probable identity of *Motacilla ocularis* Swinhoe and *M. amurensis* Seebohm, with remarks on an allied supposed species, *M. blakistoni* Seebohm. Proc. U. S. Nat. Mus., 6, October 5, 1883, pp. 144-47.
The specimen of *M. ocularis* from La Paz fully described.
- 1883b. Descriptions of some new birds from Lower California, collected by Mr. L. Belding. Proc. U. S. Nat. Mus., 6, October 5, 1883, pp. 154-56.
Lophophanes inornatus cineraceus, type from Laguna; *Psaltriparus grindac*, type from Laguna; *Junco bairdi*, type from Laguna.
- 1883c. *Anthus cervinus* (Pallas) in Lower California. Proc. U. S. Nat. Mus., 6, October 5, 1883, pp. 156-57.
Specimen taken by Belding at San José del Cabo.
- 1883d. Note on *Merula cinerea* (Baird). Proc. U. S. Nat. Mus., 6, October 5, 1883, pp. 158-59.
- 1883e. Catalogue of the aquatic and fish-eating birds exhibited by the United States National Museum [at the International Fisheries Exhibition, London, 1883]. U. S. Nat. Mus., Bull. 27, 1884 (1883), pp. 139-84.
Some Lower Californian specimens recorded, with full data.
1883. [See also Belding, L., 1883a, 1883b, 1883c.]
1884. Note on *Psaltriparus grindac*, Belding. Proc. Biol. Soc. Wash., 2, April 10, 1884, p. 96.
A correction of previous description.
1884. [See Baird, S. F., Brewer, T. M., and Ridgway, R.]
- 1885a. On two hitherto unnamed sparrows from the coast of California. Proc. U. S. Nat. Mus., 7 (1884), January 19, 1885, pp. 516-18.
Passerculus beldingi recorded from Todos Santos Islands and San Quintín Bay.
- 1885b. *Icterus cucullatus*, Swainson, and its geographical variations. Proc. U. S. Nat. Mus., 8, April 20, 1885, pp. 18-19.
I. c. nelsoni recorded from Cape St. Lucas.
- 1885c. A review of the American "golden warblers." Proc. U. S. Nat. Mus., 8, September 2, 1885, pp. 348-50.
Includes original description of *Dendroica bryanti castaneiceps*, type from La Paz.

- 1885*d*. Description of a new cardinal grosbeak from Arizona. Auk, 2, October, 1885, pp. 343-45.
 With critical comment on *Cardinalis cardinalis igneus*.
- 1887*a*. A manual of North American birds. Philadelphia: J. B. Lippincott Company, 1887; pp. xii+631, 124 pls.
 Contains original descriptions of: *Aphelocoma californica hypoleuca* (p. 356), from "Cape St. Lucas, La Paz, and contiguous localities"; *Carpodacus frontalis ruberrimus* (p. 391), from "Cape St. Lucas"; *Passerina versicolor pulchra* (p. 448), type from Miraflores.
- 1887*b*. Description of two new races of *Pyrrhuloxia sinuata* Bonap. Auk, 4, October, 1887, p. 347.
 Including *Pyrrhuloxia sinuata peninsulæ*, type from San José [del Cabo].
1892. The humming birds. Rept. U. S. Nat. Mus. for 1890 [July, 1892], pp. 253-383, pls. 1-46, 47 figs. in text.
 Including full account of *Basilinna xantusii*.
1893. Description of a new storm petrel from the coast of western Mexico. Proc. U. S. Nat. Mus., 16, November 24, 1893, pp. 687-88.
Oceanodroma townsendi, type from Cape San Lucas.
- 1894*a*. On geographical variation in *Sialia mexicana* Swainson. Auk, 11, April, 1894, pp. 145-60.
 Analysis of the characters of *S. m. anabelæ*.
- 1894*b*. Geographical, versus sexual, variation in *Orcortyx pictus*. Auk, 11, July, 1894, pp. 193-97, pl. 6.
 Specimen of *O. p. plumiferus* recorded from "Campos, Lower California."
1896. A manual of North American birds. (Philadelphia: J. B. Lippincott Company); Second edition, 1896, pp. xiv+653, 124 pls.
 The Appendix (pp. 583-614) contains matter relating to Lower California birds and not in the first edition (1887*a*).
1898. Descriptions of supposed new genera, species, and subspecies of American birds. I. Fringillidæ. Auk, 15, July, 1898, pp. 223-30.
 Including *Aimophila ruficeps sororia*, type from "Victoria Mts."
- 1899*a*. New species, etc., of American birds.—III. Fringillidae (continued). Auk, 16, January, 1899, pp. 35-37.
Melospiza fasciata cooperi recorded from "San Quentin Bay."
- 1899*b*. On the generic name *Aimophila* versus *Peucaea*. Auk, 16, January, 1899, pp. 80-81.
 Refers to *Aimophila ruficeps sororia*.
- 1899*c*. New species, etc., of American birds.—IV. Fringillidæ (concluded); Corvidæ (part). Auk, 16, July, 1899, pp. 254-56.
Pipilo maculatus atratus ascribed to Lower California.
- 1901*a*-1919. The birds of north and middle America. = U. S. Nat. Mus. Bull. 50. Part 1, 1901, pp. xxx+715, 20 pls.; Part 2, 1902, pp. xx+834, 22 pls.; Part 3, 1904, pp. xx+801, 19 pls.; Part 4, 1907, pp. xxii+974, 34 pls.; Part 5, 1911, pp. xxiii+859, 33 pls.; Part 6, 1914, pp. xx+882, 36 pls.; Part 7, 1916, pp. xiii+543, 24 pls.; Part 8, 1919, pp. xvi+852, 34 pls.
 By far the most important single work relative to the systematic ornithology of Lower California, containing full descriptions, statements of distribution, and synonymies of a large majority

of the species. Includes original descriptions of the following: *Polioptila margaritæ* (pt. 3, 1904, p. 733), from Santa Margarita Island; *Micropallas whitneyi sanfordi* (pt. 6, 1914, p. 809), from Miraflores; *Pagolla wilsonia beldingi* (pt. 8, 1919, p. 112), from La Paz.

- 1901b. New birds of the families Tanagridæ and Icteridæ. Proc. Wash. Acad. Sci., 3, April 15, 1901, pp. 149-155.

Includes ascription of *Agelaius phoeniceus neutralis* (here newly named) to Lower California.

1903. Descriptions of new genera species and subspecies of American birds. Proc. Biol. Soc. Wash., 16, September 30, 1903, pp. 105-11.

Including: *Vireo huttoni cognatus*, type from Sierra de la Laguna; *Baeolophus inornatus murinus*, type from Nachoguero Valley.

1908. Type locality of *Vireo pusillus*. Auk, 25, April, 1908, pp. 224-25.

Maintains that it is Cape San Lucas.

- 1911b. Diagnosis of some new forms of Picidae. Proc. Biol. Soc. Wash., 24, February 24, 1911, pp. 31-35.

Including *Centurus uropygialis brewsteri*, type from Santiago.

ROTHSCHILD, W., and HARTERT, E.

1902. Further notes on the fauna of the Galápagos Islands. Novitates Zoologicae, 9, 1902, pp. 373-418, 5 figs. in text.

Includes record of three birds from Guadalupe, one of which, *Speotyto cunicularia beeki*, is here newly named.

SALVADORI, T.

1865. Descrizione di altre nuove specie di uccelli esistenti nel Museo di Torino. Atti della società di Scienze Naturali [Milan], 8, 1865, pp. 375-89.

Includes original description (p. 387) of "*Uria Craveri*," assumably from Natividad Island, but, upon closer reading, evidently from some island in the Gulf.

1893. Catalogue of the Columbæ, or pigeons, in the collection of the British Museum. = Cat. Birds British Mus., 21, 1893, pp. xix + 676, 15 pls.

Some specimens recorded from Lower California, notably of *Inca* dove.

SALVIN, O.

1896. [See Saunders, H., and Salvin, O.]

SALVIN, O., and GODMAN, F. D.

- 1879-1904. Biologia Centrali-Americana. Aves. 1, pp. xlv + 512; 2, pp. 4 + 598; 3, pp. 4 + 510; 4, viii pp. + 79 pls.

Contains numerous ascriptions to Lower California, nearly all of them quoted, a few erroneously.

SANFORD, L. C., BISHOP, L. B., and VAN DYKE, T. S.

1903. The water-fowl family (The Macmillan Co., New York); pp. viii + 598, 20 illus.

"Habitats" include many ascriptions to Lower California. One of these, of *Numenius tahitiensis* (p. 449), is an error (*vide* Dr. L. B. Bishop, verbally). The account of "The water-fowl of the Pacific coast," by T. S. Van Dyke, describes conditions in the delta region of the Colorado River.

SAUNDERS, H.

1875. [Remarks]. Proc. Zool. Soc. London, 1875, p. 158.

On *Larus fuscus* [= *L. occidentalis*] from Magdalena Bay. ●

SAUNDERS, H., and SALVIN, O.

1896. Catalogue of the Gavixæ and Tubinares in the collection of the British Museum. = Cat. Birds British Mus., 25, 1896, pp. xvi + 475, 8 pls., 20 figs. in text.

Specimens listed from localities in Lower California. But geography of southern upper and Lower California badly confused in places.

SCLATER, P. L.

1860. [Notice of discovery of *Amazilia xantusi*]. Ibis, 2, July, 1860, p. 309.

1886. Catalogue of the Passeriformes, or perching birds, in the collection of the British Museum. Fringilliformes: Part 2, Containing the families Cœrebidæ, Tanagridæ, and Icteridæ. = Cat. Birds British Mus., 11, 1886, pp. xviii + 432, 18 pls., many figs. in text.

Includes a very few records of Cape district birds.

1888. Catalogue of the Passeriformes, or perching birds, in the collection of the British Museum. = Cat. Birds British Mus., 14, 1888, pp. xx + 494, 26 pls., many figs. in text.

Specimens of certain flycatchers recorded from the Cape district.

SEEBOHM, H.

1881. Catalogue of the Passeriformes, or perching birds, in the collection of the British Museum. Cichlomorphæ: Part II = Cat. Birds British Mus., 5, 1881, xvi + 426, 18 pls., several figs. in text.

Ranges of some species given definitely as including "Cape St. Lucas."

SHARPE, R. B.

1874. Catalogue of the Accipitres, or diurnal birds of prey, in the collection of the British Museum. = Cat. Birds British Mus., 1, 1874, pp. xiii + 480, 14 pls., some figs. in text.

Ascribes to Lower California or vicinity: *Buteo* "*leucasanus*," pp. 189, 458; *Hierofalco gyrfalco*, p. 417; *Pandion haliaetus*, p. 451.

1875. Catalogue of the Striges, or nocturnal birds of prey, in the collection of the British Museum. = Cat. Birds British Mus., 2, 1875, pp. xii + 326, 14 pls., some figs. in text.

Burrowing owl (pp. 144, 145) first recorded from Lower California—from Magdalena Bay.

1881. Catalogue of the Passeriformes, or perching birds, in the collection of the British Museum. Cichlomorphæ: Part III. = Cat. Birds British Mus., 6, 1881, pp. xiv + 420, 18 pls., many figs. in text.

A few specimens recorded from La Paz, as taken by A. Forrer.

1885. Catalogue of the Passeriformes, or perching birds, in the collection of the British Museum. Fringilliformes: Part I, containing the Hirundinidæ, Mnioiltidæ [etc.]. = Cat. Birds British Mus., 10, 1885, pp. xiv + 682, 12 pls., some figs. in text.

Some specimens recorded, as taken in the Cape district by A. Forrer, L. Belding, or J. Xantus.

1888. Catalogue of the Passeriformes, or perching birds, in the collection of the British Museum. Fringilliformes: Part III, containing the family Fringillidæ. = Cat. Birds British Mus., 12, 1888, pp. xvi + 872, 16 pls., many figs. in text.

Specimens of various species recorded from the Cape district, part as taken by J. Xantus (these evidently obtained by exchange from the U. S. National Museum) and part as taken by A. Forrer (these from the Salvin-Godman collection).

1896. Catalogue of the Limicolæ in the collection of the British Museum. = Cat. Birds British Mus., 24, 1896, pp. xii + 796, 7 pls., 19 figs. in text.

Some of the records of specimens from Lower California are important, notably of mountain plover and surf-bird.

1903. A hand-list of the genera and species of birds. (London: British Museum), 4, 1903, pp. xii + 391.

On page 350: [*Sitta albinucha*, nom. emend. [for *S. leuconucha* of Anthony because "Vox hybrida"!]].

SHARPE, R. B., and OGILVIE-GRANT, W. R.

1892. Catalogue of the Picariæ in the collection of the British Museum. = Cat. Birds British Mus., 17, 1892, pp. xii + 522, 17 pls.

Includes record (p. 136) [not verified] of green kingfisher from La Paz.

1898. Catalogue of the Plataleæ, Herodiones, Steganopodes, Pygopodes, Alcæ, and Impennes in the collection of the British Museum. = Cat. Birds British Mus., 26, 1898, pp. xviii + 688, 14 pls., 9 + 2 figs. in text.

Contained references to birds of Lower California are not important.

SLEVIN, J. R.

1923. Expedition of the California Academy of Sciences to the Gulf of California in 1921 | General account. Proc. Calif. Acad. Sci., ser. 4, 12, June 2, 1923, pp. 55-72, map.

Conspicuous birds are mentioned in course of the narrative. These are reported upon more formally elsewhere (Mailliard, 1923).

STEJNEGER, L.

1884. *Analecta ornithologica*. Auk, 1, April, 1884, pp. 166-73.

Cardinalis ruber igneus (p. 172).

STEPHENS, F.

1904. Cactus wrens. Condor, 6, March, 1904, pp. 51-52.

Systematic status on each side of the Mexican border in vicinity of San Diego.

1921. Early spring notes on birds of Coronado Islands, Mexico. Condor, 23, May, 1921, pp. 96-97.

On 18 species.

STONE, W.

1916. Changes in the A. O. U. check-list of North American birds proposed since the publication of the sixteenth supplement. Auk, 33, October, 1916, pp. 425-531.

Some affecting Lower California.

1918. [Review of] Murphy on the natural history of the Mexican portion of the Colorado Desert. *Auk*, 35, April, 1918, p. 248.
1919. [Review of] Dwight on a new gull [*Larus occidentalis livens*]. *Auk*, 36, April, 1919, p. 301.
1922. [Review of] Nelson's 'Lower California and its natural resources.' *Auk*, 39, July, 1922, pp. 431-32.
1923. [Review of] Townsend on birds collected in Lower California. *Auk*, 40, July, 1923, p. 553.

STONE, W., and RHOADS, S. N.

1905. On a collection of birds and mammals from the Colorado delta, Lower California. *Proc. Acad. Nat. Sci. Phila.*, September [= December 6], 1905, pp. 676-90. "With field notes by Samuel N. Rhoads."
- Where specimens were not taken, species being merely "observed by Mr. Rhoads," the value of this list is very doubtful. In numerous of these cases the identification given is well-nigh impossible!

STREETS, T. H.

1877. Contributions to the natural history of the Hawaiian and Fanning islands and Lower California, made in connection with the United States North Pacific surveying expedition, 1873-75. = *U. S. Nat. Mus.*, Bull. 7, 1877, 172 pp.; Ornithology, pp. 9-33.
- Identifications by Coues. About 20 species recorded from localities properly belonging to Lower California, as taken in 1874-75. Most are first records for the peninsula.

SWANN, H. K.

1922. A synopsis of the Accipitres (diurnal birds of prey) comprising species and subspecies described up to 1920, with their characters and distribution. Second edition, revised and corrected throughout. London: Wheldon & Wesley, Ltd., 1922; pp. viii + 233 + 3.
- Contains brief critical comment on some well-known forms from Lower California.
- 1924-1926. A monograph of the birds of prey (London, Wheldon & Wesley, Ltd.); Parts I-VI, pp. i-ix, 1-396, 24 colored plates.
- Contains numerous systematic and geographical statements bearing upon Lower California. Egg of the California condor recorded (p. 21) from San Pablo Peak.

SWARTH, H. S.

1913. Note on the Guadalupe caracara. *Condor*, 15, November, 1913, pp. 228-29.
1914. A study of the status of certain island forms of the genus *Salpinctes*. *Condor*, 16, September, 1914, pp. 211-17.
- Includes original description of *Salpinctes guadeloupensis proximus*, type from San Martin Island.
- 1918a. The Pacific coast jays of the genus *Aphelocoma*. *Univ. Calif. Publ. Zool.*, 17, February 23, 1918, pp. 405-22, 1 fig.
- Considers *Aphelocoma californica obscura* Anthony inseparable from *A. c. californica*, and *A. hypoleuca* a full species.
- 1918b. The distribution of the subspecies of the brown towhee (*Pipilo crissalis*). *Condor*, 20, May, 1918, pp. 117-21, figs. 19-20.
- Including *Pipilo crissalis senicula* of northern Lower California.

1920. [Review of Oberholser's] A revision of the subspecies of *Passerculus rostratus* (Cassin). *Condor*, 22, March, 1920, pp. 81, 84.
1926. [See Grinnell, J., and Swarth, H. S.]

THAYER, J. E.

- 1909a. Some rare birds and sets of eggs from the Cape region of Lower California. *Condor*, 11, January, 1909, pp. 10-11.
Mangrove warbler, Belding rail, etc.
- 1909b. [Letters from W. W. Brown, Jr.]. *Condor*, 11, July, 1909, pp. 142-43.
Collector's notes on birds in vicinity of La Paz.
- 1909c. Frazar's oyster catcher's eggs. *Oologist*, 26, November, 1909, pp. 188-89.
From Natividad Island and near La Paz.
- 1909d. The eggs of Heermann's gull discovered. *Oologist*, 26, July, 1909, p. 101.
On Ildefonso Island. Some other birds also recorded from there.
- 1911a. Eggs and nest of the San Lucas robin. *Oologist*, 28, April, 1911, p. 77.
From the Sierra de la Laguna.
- 1911b. A nesting colony of Heermann gulls and Brewster boobies. *Condor*, 13, May, 1911, pp. 104-6, figs. 34-36.
On "Idlefonso" [= Ildefonso] Island.
- 1911c. Eggs of the elegant tern. *Oologist*, 28, November, 1911, p. 171.
From Cerralvo Island.

THAYER, J. E., and BANGS, O.

- 1907a. A new race of the Californian thrasher from Lower California. *Proc. New England Zool. Club*, 4, April 30, 1907, pp. 17-18.
Original description of *Toxostoma rediviva helva*, type from Rosario.
- 1907b. Birds collected by W. W. Brown, Jr., on Cerros, San Benito and Natividad islands in the spring of 1906, with notes on the biota of the islands. *Condor*, 9, May, 1907, pp. 77-81.
A total of 29 species from Cerros, 9 from Natividad, and 7 from the San Benitos.
- 1907c. Catalog of birds collected by W. W. Brown, Jr., in middle Lower California. *Condor*, 9, September, 1907, pp. 135-40.
Annotated list of 73 species.
1908. The present state of the ornithology of Guadalupe Island. *Condor*, 10, May, 1908, pp. 101-6.
Comment upon 23 species of birds.
1909. Description of a new subspecies of the snowy heron. *Proc. New England Zool. Club*, 4, April 29, 1909, pp. 39-41.
Egretta candidissima brewsteri; type from San José Island, near La Paz.
1912. A new race of great blue heron from Espiritu Santo Island, Lower California. *Proc. New England Zool. Club*, 4, February 23, 1912, pp. 83-84.
Ardea herodias sancti-lucae; type from Espiritu Santo Island.

THOBURN, W. W.

1899. Report of an expedition in search of the fur seal of Guadalupe Island, Lower California, June, 1897. Including a survey of the island and notes on the animal and plant life of the region. Fur seals and fur-seal islands of north Pacific Ocean (Washington, Gov't Printing Office), Part 3, 1899, pp. 275-83.

"The birds of Guadalupe Island," p. 278; ten species, annotated unimportantly.

TODD, W. E. C.

1913. A revision of the genus *Chæmepelia*. *Annals Carnegie Mus.*, 8, May 8, 1913, pp. 507-603.

Full critical account of *C. passerina pallescens* (p. 534), with list of specimens (p. 594) from Lower California.

1922. A new sparrow from southern California. *Condor*, 24, July, 1922, pp. 126-27.

Aimophila ruficeps canescens recorded from several localities in northern Lower California.

1923. *Spinus pinus macropterus*, an addition to the A. O. U. check-list. *Auk*, 40, April, 1923, p. 330.

From San Pedro Mártir Mountains.

TOWNSEND, C. H.

1890. Birds from the coasts of western North America and adjacent islands, collected in 1888-'89, with descriptions of new species. *Proc. U. S. Nat. Mus.*, 13, 1890, pp. 131-42.

• Includes original description of *Amphispiza belli cinerea* (p. 136), type from Ballenas Bay, and records of 27 other species from this and several other mainland and island localities.

1911. [Account of expedition to Lower California]. *Auk*, 28, July, 1911, pp. 390-91.

With important comments upon *Oceanodroma kaedingi*.

1916. Voyage of the 'Albatross' to the Gulf of California in 1911. *Bull. Am. Mus. Nat. Hist.*, 35, August 2, 1916, pp. 399-476, figs. 1-45, 1 map.

In course of narrative a good many birds are ascribed, by vernacular names only, to various Lower Californian localities. Some of these seem to me to be errors; for example, "black-chinned" hummingbird (p. 409) from Cedros Island, and "golden-crowned" sparrow (p. 413) from San Bartolomé Bay. Since the birds of this expedition were subsequently (Townsend, 1923) reported upon by the same author, I have ignored those narrative ascriptions, as being superseded by the more formal, later records.

1923. Birds collected in Lower California. *Bull. Am. Mus. Nat. Hist.*, 48, March 9, 1923, pp. 1-26, figs. 1-3, pl. I, map.

Numerous species recorded, from both islands and mainland. All the Gulf localities except Tiburón and San Estéban islands (Sonora) pertain to Lower California as here understood.

VAN DENBURGH, J.

1924. The birds of the Todos Santos Islands. *Condor*, 26, March, 1924, pp. 67-71.

Annotated list of 54 species.

VAN DYKE, T. S.

1903. [See Sanford, L. C., Bishop, L. B., and Van Dyke, T. S.]

VAN ROSSEM, A. J.

1909. Some unrecorded species from Los Coronados Islands, Mexico. *Condor*, 11, November, 1909, p. 208.
Nine, nearly all transient.
1915. Notes on murrelets and petrels. *Condor*, 17, March, 1915, pp. 74-78, figs. 26-28.
As occurring on and around Los Coronados Islands.
1924. A survey of the song sparrows of the Santa Barbara Islands. *Condor*, 26, November, 1924, pp. 217-20.
Including *Melospiza melodia coronatorum* of Los Coronados Islands.
- 1924, 1925. [See Dickey, D. R., and van Rossem, A. J.]
1925. The status of the San Clemente house finch. *Condor*, 27, July, 1925, pp. 176-77.
Linnets from Los Coronados Islands are *Carpodacus mexicanus clementis*.
- 1926a. The Craveri murrelet in California. *Condor*, 28, March, 1926, pp. 80-83, fig. 30.
Contains important facts as to extent of occurrence in Lower California.
- 1926b. The California forms of *Agelaius phoeniceus* (Linnaeus). *Condor*, 28, September, 1926, pp. 215-30, figs. 72-76.
A. p. neutralis from northwestern Lower California.
- 1926c. The Lower California reddish egret. *Condor*, 28, September, 1926, p. 246.
Original description of *Dichromanassa rufescens dickeyi*; type from San Luis Island.

VAN TYNE, J.

1925. An undescribed race of *Phainopepla*. *Occas. Papers Boston Soc. Nat. Hist.*, 5, May 22, 1925, pp. 149-50.
Phainopepla nitens lepida, ascribed to Lower California.

WILLETT, G.

1913. Bird notes from the coast of northern Lower California. *Condor*, 15, January, 1913, pp. 19-24, and 184 (correction).
Ninety-eight species listed, from certain islands as well as the mainland coast, as far south as "Cerro" Island. A few of the water birds, however, are mentioned only as noted on San Diego Bay.

WRIGHT, H. W.

1909. An ornithological trip to Los Coronados Islands, Mexico. *Condor*, 11, May, 1909, pp. 96-100, 3 figs. in text.
Twenty-three species of birds listed.
1913. The birds of San Martin Island, Lower California. *Condor*, 15, November, 1913, pp. 207-10, figs. 60-65.
Notes on 12 species.

XANTUS, J.

1859. Descriptions of supposed new species of birds from Cape St. Lucas, Lower California. Proc. Acad. Nat. Sci. Phila., November, 1859, pp. 297-99.

Picus lucasanus, *Campylorhynchus affinis*, *Harporhynchus cinereus*, and *Brachyrhamphus hypoleucus*.

1860. Utazás | Kalifornia déli részeiben. | — | Irta | Xántus János, | a természettudományok philadelphiai akademiája, | az amerikai philosophiai társulat s a bostoni athenaeum | rendes tagja. | — | Egy Földképpel, | Nyolcz kö- és nyolcz fametszettel. | — | Pesten, | Kiadják Lauffer és Stolp | 1860. Post 8vo [137×215 mm.], pp. 10 + 1-191 + 4, paper cover, map [of the Californias], 15 illus.

No accurate translation of this seemingly important account has been available to me. See below.

1861. Johann Xántus' Reise durch die Kalifornische Halbinsel, 1858. (Extracted from the Hungarian "Utazás Kalifornia déli részeiben" by J. Hunfalvy.) Petermann's Geographische Mittheilungen, Heft 4, April, 1861, pp. 133-43.

Narrative account of a trip from San Diego to La Paz and return, in April and May, 1858. I am unable to follow the itinerary exactly as described south overland from San Bartolomé Bay. Nor do I understand some of the included natural history on the basis of present-day knowledge. Possibly this is not an exact translation.

The interesting statement is made (p. 140) that upwards of 300 different kinds of birds are to be enumerated from the peninsula of Lower California. And yet there is nothing to indicate that Xántus brought back any actual specimens from this, his first or preliminary trip into Lower California. He could, as yet, have gained very little definite knowledge of the bird life of the territory through which he so rapidly passed.

INDEX TO SCIENTIFIC AND VERNACULAR NAMES

This index is intended to include not only the scientific names employed in the headings of the accounts of the species and subspecies formally listed in the present paper but also all the scientific names mentioned in the text under each heading, hence all that have ever been applied definitely to any bird in connection with its ascription to Lower California (see p. 53). The user should thus be enabled, in going over preceding literature relating to the territory in question, to locate any earlier name or name-combination encountered, under the designation now current. Minor variations in spelling, easily recognized as such, are, however, not here repeated.

As to vernaculars, only those employed in the headings in the present paper are included in this index; no such synonymic thoroughness is attempted as in the case of the scientific names.

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**THE AVIFAUNA OF EMERYVILLE
SHELLMOUND**

**BY
HILDEGARDE HOWARD**

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BY
HILDEGARDE HOWARD

(Contribution from the University of California Museum of Vertebrate Zoology)

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INTRODUCTION

HISTORY OF INVESTIGATIONS OF SHELLMOUNDS IN CALIFORNIA

Along the coast of California there have been uncovered, within recent years, many Indian shellmounds. These consist largely of refuse, fireplaces, and burials, directly associated with long residence on the same site. Along the shores of San Francisco Bay, over four hundred mounds have been discovered and the contents of a representative number examined by anthropologists. One of the first in the San Francisco district to be examined scientifically was the Emeryville mound. This investigation was carried on by Professor John C. Merriam and Dr. Max Uhle, then of the University of California, and the results were subsequently published by Uhle (1907). The reader is referred to Uhle's paper (1907, pp. 6 and 7) for an account of still earlier publications relating to shellmounds of California in general.

Later, Dr. N. C. Nelson (1909) published a paper on his survey of the shellmounds of the entire Bay region, and since then intermittent field work has been carried on in these localities. In 1924, the Emeryville mound, which since 1876 had been the site of a picnic resort, was leveled for a factory site and thoroughgoing study and collecting became possible on a large scale. All the artifacts and human remains from the mound were added to the collections in the Department of Anthropology of the University of California, while all the animal remains were placed in the California Museum of Vertebrate Zoology. Of these, the bird bones have been used as the basis for the present paper. The anthropological results of this latest excavation appeared in a paper by Schenck (1926).

The method of procuring the recovered materials involved (1) removal of specimens in the upper portion of the mound as they were unearthed by the steam shovel, (2) examination of material in the dump pile, and (3) removal of material from the lower levels by means of controlled excavations. Relatively little material was obtained by this latter means, but, on the other hand, a better knowledge of actual stratigraphic relations was possible.

ACKNOWLEDGMENTS

For the collecting of the greater portion of the animal remains from the Emeryville mound, credit is due Miss Edna M. Fisher, Assistant Curator in Osteology of the California Museum of Vertebrate Zoology. Most of the material now available in the Museum was collected, cleaned, and catalogued by Miss Fisher. Thanks are also due the Department of Anthropology of the University of California for its cooperation in turning over to the Museum of Vertebrate Zoology the vertebrate bones from their collections.

The present work has been carried on under the supervision of Dr. Joseph Grinnell, Director of the California Museum of Vertebrate Zoology, and Dr. Loye H. Miller, of the University of California at Los Angeles. The writer wishes to express her appreciation to Dr. Grinnell for placing the Museum collections at her disposal, to Dr. Miller for the loan of skeletal material from his collection, and to both Dr. Grinnell and Dr. Miller for their helpful advice and criticism.

Others to whom the writer extends her acknowledgments for their cooperation are Mr. E. W. Gifford, Dr. A. L. Kroeber, Dr. Jean M. Linsdale, Dr. William D. Matthew, Mr. E. D. Pressler, Mr. W. Egbert Schenck, and Dr. Alexander Wetmore.

EMERYVILLE SHELLMOUND

LOCATION

Emeryville is located on the east side of San Francisco Bay, between Oakland and Berkeley, in Alameda County, California. This region was originally the site either of several distinct shellmounds or of one large, irregular mound having several cones. At the time of the Merriam and Uhle investigations two such cones were in evidence, but Schenck (1926, p. 155) refers to earlier data indicating the presence originally of still other cones. The investigations, however, have been largely confined to one large cone (Cone A of Schenck's paper) to which the name Emeryville shellmound is now applied. This cone was located near Emeryville at what is now known as Shellmound Station. At the time of excavation, in 1924, it was bounded on the north by the Sherwin and Williams Sulfur plant, on the south by the overhead bridge and a factory, on the east by the Southern Pacific tracks, and on the west by San Francisco Bay.

SHAPE AND SIZE

The original shape and size of the Emeryville mound are, of course, now matters of question. Schenck (1926, pp. 161-162) discusses the subject in some detail and concludes with a summary as follows:

The mound when we began work on it had been considerably distorted; we deal largely with an approximately conical section with diameters of 150 and 250 feet and a height of 22 feet containing, according to truck measurement as it was hauled away, 26,500 cubic yards; this section may not properly be projected into a larger cone with a circular base but is simply a portion of a very large irregular mass.

AGE

Regarding the time of occupation of the Emeryville site by the Indians, there is no definite information available. A Spaniard, Don Pedro Fages, is the first recorded traveler in this region (Bolton, 1926, p. 329). In 1772, he, with Fray Juan Crespi, traveled from Monterey north along the eastern side of San Francisco Bay as far as the Carquinez Strait. Crespi kept a detailed diary of this journey (Palóu, 1874, pp. 3-24; Bolton, 1926, pp. 329-348). He reported Indian settlements at many places both north and south of the Emeryville site, but none in that region. On March 26 and 27, 1772, the journey lay between the present site of East Oakland and Strawberry Creek along the top of the Berkeley hills overlooking the Golden Gate. The report for this region (Bolton, 1926, pp. 338-341) noted the presence of three islands in the Bay, and on the plain which stretched from the hills to the Bay "many lirios (a species of lily) and an abundance of leafy sweet marjoram." Crespi further reported that "Neither in this march [the one of March 27] nor in the preceding one have we seen a single heathen, and very few tracks of them." It would seem that since the day was clear enough to see the islands and to remark upon the herbage in the plain beneath the hills, an Indian village on the Bay shore would certainly have been noted had it been in existence. The occupation of the Emeryville site and the formation of the shell-mound by the Indians must, then, have occurred previous to this time, for in less than fifty years—in 1820—the land in this region was granted to Luiz Maria Peralta and from that time its history is well recorded, but includes no reference to native Indians.

Since the latest date of occupation of the Emeryville site is thus prehistoric, the age of the mound cannot be definitely estimated.

Various methods have been employed, however, to determine the approximate age. The fact that the lowest level of the mound is now two feet below high tide level is considered by Uhle (1907, pp. 9-14) to be of some importance; but Schenck (1926, pp. 163-165) denies the value of this observation as an indicator of great age. A more substantial basis for age determination lies in an estimation of the amount of time necessary for the accumulation of a mound of this size. Schenck (1926, pp. 205-212) reviews the ideas that have been put forth on this subject and sums up his own views as follows (*op. cit.*, p. 211): "In short, 1000 years would appear to be the greatest possible period allowable for the time of accumulation of all shellmound material on the Emeryville site." For the purpose of this paper, the exact age is unimportant, so long as the mound does not date back to an earlier geologic period. An age of a thousand, or even five thousand, years would still be well within the Recent period.

ENVIRONMENT

The situation of Emeryville was ideal for early man; and equally ideal for numerous types of wild life. From the alluvial plain three or four miles in width, upon which the mound is situated, the land rises into the foothills of the Coast Ranges attaining a maximum elevation of about 1800 feet. To the south is Temescal Creek, running from the hills to empty into the Bay about 800 feet southwest from the center of the mound. This creek is now very much reduced, having been dammed some years ago to form Temescal Lake in the hills, but its former size may be appreciated by reference to the message of Mayor Merritt of Oakland on March 15, 1869 (Wood, 1883, p. 650) in which he said, regarding the introduction of Temescal Creek waters into the city of Oakland, "During eight or nine months of the year the natural flow of water in the Temescal Creek is sufficient to supply the requirements of this city. . . ." This creek contributed largely to the abundance and variety of life possible in the region. First, its banks afforded suitable conditions for the growth of buckeye and willow trees; Schenck (1926, p. 156) refers particularly to a large "willow thicket" twenty acres in extent just south of the creek, near the Bay. Second, it overflowed its banks near the Bay, producing marshy ground bearing luxuriant plant growth. Also, the same authority notes the fact that the creek was, even within history, famous for its salmon runs. Farther south, beyond the willow

trees, was a large salt marsh about one and one-half miles in length and three-quarters of a mile in width at its southern end. Beyond the marsh was a grove of oaks, extending for about a mile, where the land rose slightly. North of the mound, the land was not marshy, and there were few trees. West, of course, is the Bay, which in earlier times was certainly at a greater distance from the mound than at present. Even within history, it is known that at low tide there was a clean, white, sandy beach exposed (Schenck, 1926, p. 157).

There were within this region, then, at least eight associational areas (habitats), all of which occur within the San Francisco Bay faunal area, of the Upper Sonoran life-zone. The habitats represented are: open water (estuarine), sandy beach, salt marsh, tule marsh, willow, live oak, grassland, and chaparral. These habitats may be characterized by the following species—plant and animal.¹

HABITATS

Open water (estuarine)—

MAMMALS

Enhydra lutris, Sea Otter
Delphinus delphis, Common Dolphin
Phocaena phocaena, Bay Porpoise

BIRDS

Gavia immer, Common Loon
Gavia pacifica, Pacific Loon
Gavia stellata, Red-throated Loon
Colymbus nigricollis, Eared Grebe
Aechmophorus occidentalis, Western Grebe
Phalacrocorax auritus albociliatus, Farallon Cormorant
Phalacrocorax penicillatus, Brandt Cormorant
Nyroca valisineria, Canvas-back Duck
Nyroca marila, Greater Scaup Duck
Nyroca affinis, Lesser Scaup Duck
Glaucionetta clangula, Golden-eye
Charitonetta albeola, Buffle-head Duck
Melanitta deglandi, White-winged Scoter
Melanitta perspicillata, Surf Scoter
Mergus serrator, Red-breasted Merganser
Lobipes lobatus, Northern Phalarope
Larus (8 species), Gulls
Uria troille, Murre

¹ The following lists have been prepared after consultation with Mr. Herbert Mason, of the department of Botany, and Dr. Joseph Grinnell and Dr. E. Raymond Hall, of the California Museum of Vertebrate Zoology, and after reference to the papers of Allen (1914), Grinnell (1914, 1915, 1923), Grinnell and Swarth (1913), Grinnell and Wythe (1927), and Jepson (1925).

Sandy beach—

BIRDS

Charadrius nivosus, Snowy Plover.
Charadrius semipalmatus, Semipalmated Plover
Squatarola squatarola, Black-bellied Plover
Catoptrophorus semipalmatus, Willet
Pisobia minutilla, Least Sandpiper
Ereunetes mauri, Western Sandpiper
Calidris alba, Sanderling
Larus (8 species), Gulls

Salt marsh—

PLANTS

Distichlis spicata, Salt Grass
Salicornia ambigua, Pickle-weed
Cuscuta salina, Marsh Dodder
Grindelia cuneifolia, Marsh Grindelia

MAMMALS

Sorex vagrans halicoetes, Salt Marsh Shrew
Mustela xanthogenys, California Weasel
Reithrodontomys raviventris, Red-bellied Harvest Mouse
Microtus californicus (subsp.?), California Meadow Mouse

BIRDS

Ardea herodias, Great Blue Heron.
Rallus obsoletus, California Clapper Rail
Circus hawaiiensis, Black Rail
Numenius americanus, Long-billed Curlew
Catoptrophorus semipalmatus, Willet
Totanus melanoleucus, Greater Yellow-legs.
Pisobia minutilla, Least Sandpiper
Limnodromus griseus scolopaceus, Long-billed Dowitcher
Ereunetes mauri, Western Sandpiper
Lobipes lobatus, Northern Phalarope
Asio flammeus, Short-eared Owl
Geothlypis trichas sinuosa, San Francisco Yellow-throat
Passerculus sandwichensis bryanti, Bryant Savannah Sparrow
Melospiza melodia pusillula, Salt Marsh Song Sparrow

Tule marsh—

PLANTS

Typha latifolia, Common Cat-tail
Sparganium eurycarpum, Bur-reed
Ruppia maritima, Ditch-grass
Scirpus acutus, Common Tule
Scirpus californicus, California Bulrush

MAMMALS

Microtus californicus (subsp.?), California Meadow Mouse
Castor canadensis, Beaver
Cervus sp., Elk

BIRDS

Podilymbus podiceps, Pied-billed Grebe
Ardea herodias, Great Blue Heron
Nycticorax nycticorax, Black-crowned Night Heron
Botaurus lentiginosus, American Bittern
Circus hudsonius, Marsh Hawk
Rallus virginianus, Virginia Rail
Porzana carolina, Sora Rail
Totanus melanoleucus, Greater Yellow-legs
Recurvirostra americana, American Avocet
Asio flammeus, Short-eared Owl
Telmatorhynchus palustris, Marsh Wren
Geothlypis trichas occidentalis, Western Yellow-throat
Melospiza melodia santaecrucis, Santa Cruz Song Sparrow

Willow—

PLANTS

Salix lasiandra, Yellow Willow
Salix lasiolepis, Arroyo Willow
Populus trichocarpa, Black Cottonwood
Myrica californica, Wax Myrtle
Stachys chamissonis, Hedge Nettle
Lonicera involucrata, Black Twinberry

MAMMALS

Lynx rufus, Wildcat
Peromyscus maniculatus, White-footed Mouse
Neotoma fuscipes, Wood Rat
Sylvilagus audubonii, Cottontail

BIRDS

Butorides virescens, Green Heron
Nycticorax nycticorax, Black-crowned Night Heron
Accipiter velox, Sharp-shinned Hawk
Accipiter cooperii, Cooper Hawk
Empidonax traillii, Traill Flycatcher
Hylocichla ustulata, Russet-backed Thrush
Vireo gilvus, Warbling Vireo
Dendroica aestiva, Yellow Warbler
Spinus tristis salicamans, Willow American Goldfinch
Melospiza melodia santaecrucis, Santa Cruz Song Sparrow

Live oak—

PLANTS

Symphoricarpos albus, Snow Berry
Quercus agrifolia, Coast Live Oak
Rhus diversiloba, Poison Oak

MAMMALS

Canis ochropus, Valley Coyote
Mephitis occidentalis, Striped Skunk
Thomomys bottae, California Pocket Gopher
Citellus beecheyi, California Ground Squirrel
Odocoileus, sp., Deer

BIRDS

Buteo borealis, Red-tailed Hawk
Falco sparverius, Sparrow Hawk
Zenaidura macroura, Mourning Dove
Otus asio, Screech Owl
Bubo virginianus, Great Horned Owl
Balanosphyra formicivora, Acorn-storing Woodpecker
Corvus brachyrhynchos, American Crow
Baeolophus inornatus, Plain Titmouse
Spinus psaltria, Arkansas Goldfinch

Grassland—

PLANTS

Briza minor, Quaking Grass
Melica imperfecta, Onion Grass
Elymus glaucus, Western Rye Grass
Avena fatua (native?), Wild Oat
Chlorogalum pomeridianum, Soap Plant
Brodiaea laxa, Grass Nut
Brodiaea coronaria, Harvest Brodiaea
Brodiaea capitata, Blue Dicks
Plantago crecta, Plantain

MAMMALS

Scapanus latimanus, California Mole
Canis ochropus, Valley Coyote
Mephitis occidentalis, Striped Skunk
Taxidea taxus, California Badger
Reithrodontomys megalotis, Harvest Mouse
Peromyscus maniculatus, White-footed Mouse
Microtus californicus, California Meadow Mouse
Thomomys bottae, California Pocket Gopher
Citellus beecheyi, California Ground Squirrel
Lepus californicus, California Jack Rabbit
Sylvilagus audubonii, Cottontail
Antilocapra americana, Pronghorn Antelope

BIRDS

Falco sparverius, Sparrow Hawk
Grus canadensis, Little Brown Crane
Speotyto cunicularia, Burrowing Owl
Otocoris alpestris, Horned Lark
Sturnella neglecta, Meadowlark
Passerculus sandwichensis alaudinus, Western Savannah Sparrow
Poocetes gramineus, Vesper Sparrow

Chaparral—

PLANTS

Quercus agrifolia, Coast Live Oak
Rubus vitifolius, California Blackberry
Rubus parviflorus, Thimble-berry
Rhus diversiloba, Poison Oak
Rhamnus californica, Coffee Berry
Ceanothus thyrsiflorus, Blue Blossom
Garrya elliptica, Silk Tassel Bush
Baccharis pilularis, Chaparral Broom

MAMMALS

Spilogale phenax, California Spotted Skunk
Lynx rufus, Wildcat
Peromyscus truei, True White-footed Mouse
Peromyscus californicus, Parasitic White-footed Mouse
Neotoma fuscipes, Dusky-footed Wood Rat
Sylvilagus bachmani, Brush Rabbit
Odocoileus sp., Deer

BIRDS

Accipiter velox, Sharp-shinned Hawk
Accipiter cooperii, Cooper Hawk
Lophortyx californica, California Quail
Geococcyx californianus, California Road-runner
Psaltiriparus minimus, Bush-tit
Chamaea fasciata, Wren-tit
Thryomanes bewickii, Bewick Wren
Toxostoma redivivum, California Thrasher
Pipilo maculatus, Spotted Towhee
Pipilo fuscus, Brown Towhee
Passerella iliaca, Fox Sparrow
Zonotrichia leucophrys nuttalli, Nuttall White-crowned Sparrow

MATERIAL AVAILABLE

The bird bones which were collected at the time of leveling the Emeryville mound in 1924 number over 6700. Of these, 4155 are identifiable, and it is upon a study of this group that the present paper is based. This figure refers to actual number of specimens and not to individuals, or even to individual elements, for the majority of the specimens are of fragments rather than of entire elements. The limb bones are usually broken into either two or three pieces. Other elements such as the sternum, pelvis, and skull show no regularity in breakage. Many of the broken limb bones are charred at the broken end. This fact, together with the uniformity of breakage, especially in the larger bones, distinguishes the shellmound as a man-made deposit.

A few bones are partially altered chemically. These are grayish in color and clink like pieces of thin, hollowed stone when dropped to the table. Petrification has not progressed far, however, for a slight reaction may be obtained with hydrochloric acid, and the bones are still light in weight.

From the point of view of a paleontologist, the bird remains of the mound are in good condition, being for the most part unworn mechanically and unaltered chemically. From the point of view of the anatomist or osteologist, who is in the habit of making his observations upon laboratory-prepared specimens, however, the bones, broken by the Indians, and covered with dirt and ash, do not present so favorable an appearance.

With the exception of the scapholunar, quadrate, and possibly the hyoid, which in a fragmentary state might well be unrecognizable, every element of the bird skeleton is represented in the collections from the mound. In order of abundance the different elements occur as follows: humerus (879), coracoid (486), ulna (333), carpo-metacarpus (303), sternum (297), scapula (255), tibiotarsus (210), tarsometatarsus (201), femur (195), radius (154), pelvis (150), sacrum (136), single vertebra (119), wing phalanx (112), mandible (99), furcula (86), rib (65), skull (52), foot phalanx (14), rostrum (8), cuneiform (1). The greater abundance of specimens of one element over those of another may be in part accounted for (1) by the fragmentary condition of the limb bones, of which the humerus and ulna are most frequently broken, as before described; (2) by the

fragility of such elements as the sternum, pelvis, and skull, many specimens of which are present in a more or less fragmentary state; and (3) by the size and shape of the element; small elements are more easily overlooked, and a shapeless bone, the sliver-like radius, or the compact cuneiform, may also be passed over by the collector.

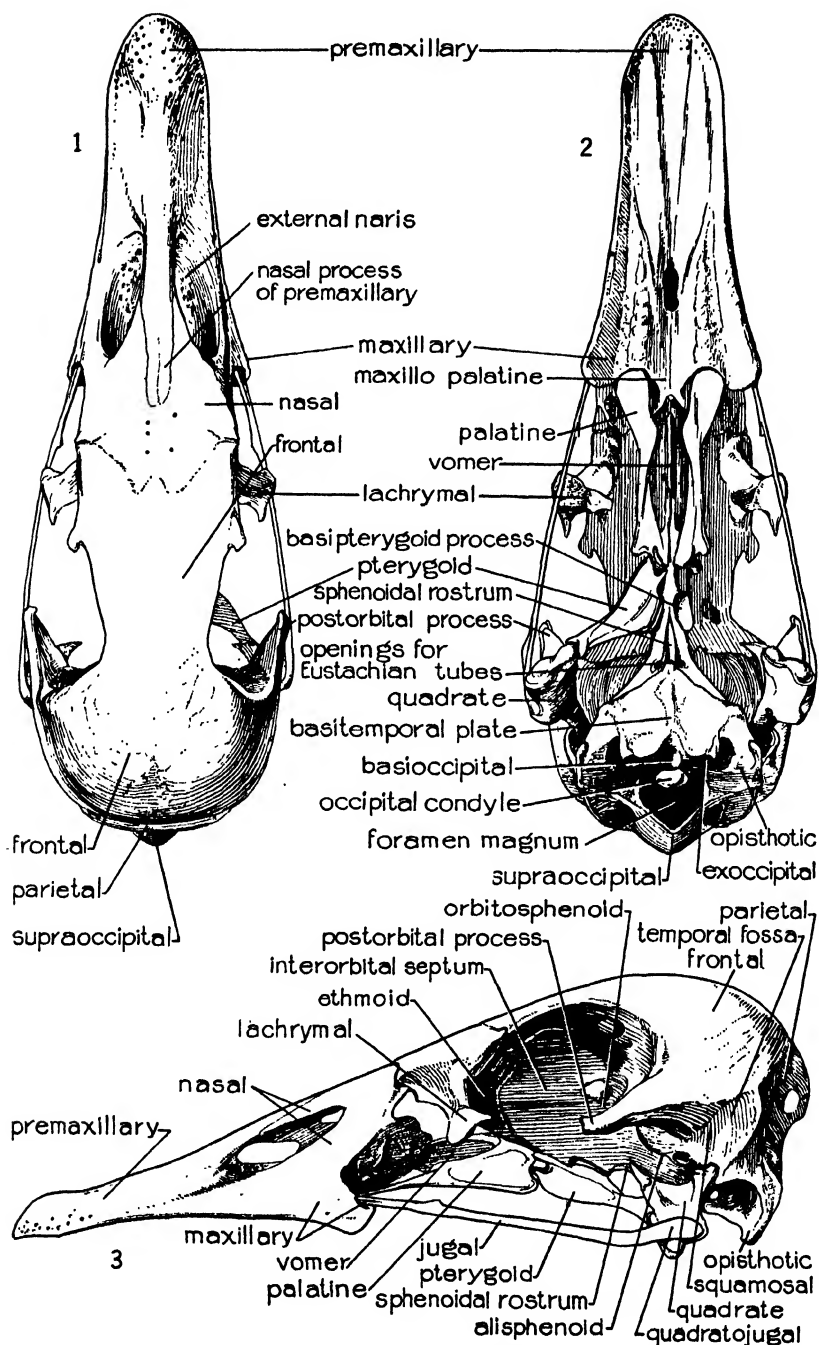
The orders of birds represented in the Emeryville collection include all but six of those of the San Francisco Bay region today. Those missing are the Columbiformes, Cuculiformes, Caprimulgiformes, Micropodiiformes, Coraciiformes, and Piciformes. In sequence of abundance the orders represented are: Anseriformes, Pelecaniformes, Charadriiformes, Falconiformes, Passeriformes, Gaviiformes, Gruiformes, Strigiformes, Colymbiformes, Ciconiiformes, Galliformes, and Procellariiformes. Each of these orders will now be discussed separately, with an account of the families, genera, and species represented. The plan of discussion will accord with the most recent taxonomic arrangement as proposed for the forthcoming revised edition of the American Ornithologists' Union Check-list of North American Birds (see Grinnell and Wythe, 1927, pp. 21-34).

In the diagnostic descriptions which follow, only the main skeletal elements will be discussed in detail; the vertebrae, ribs, cuneiform, and phalanges of the wing and foot are omitted.

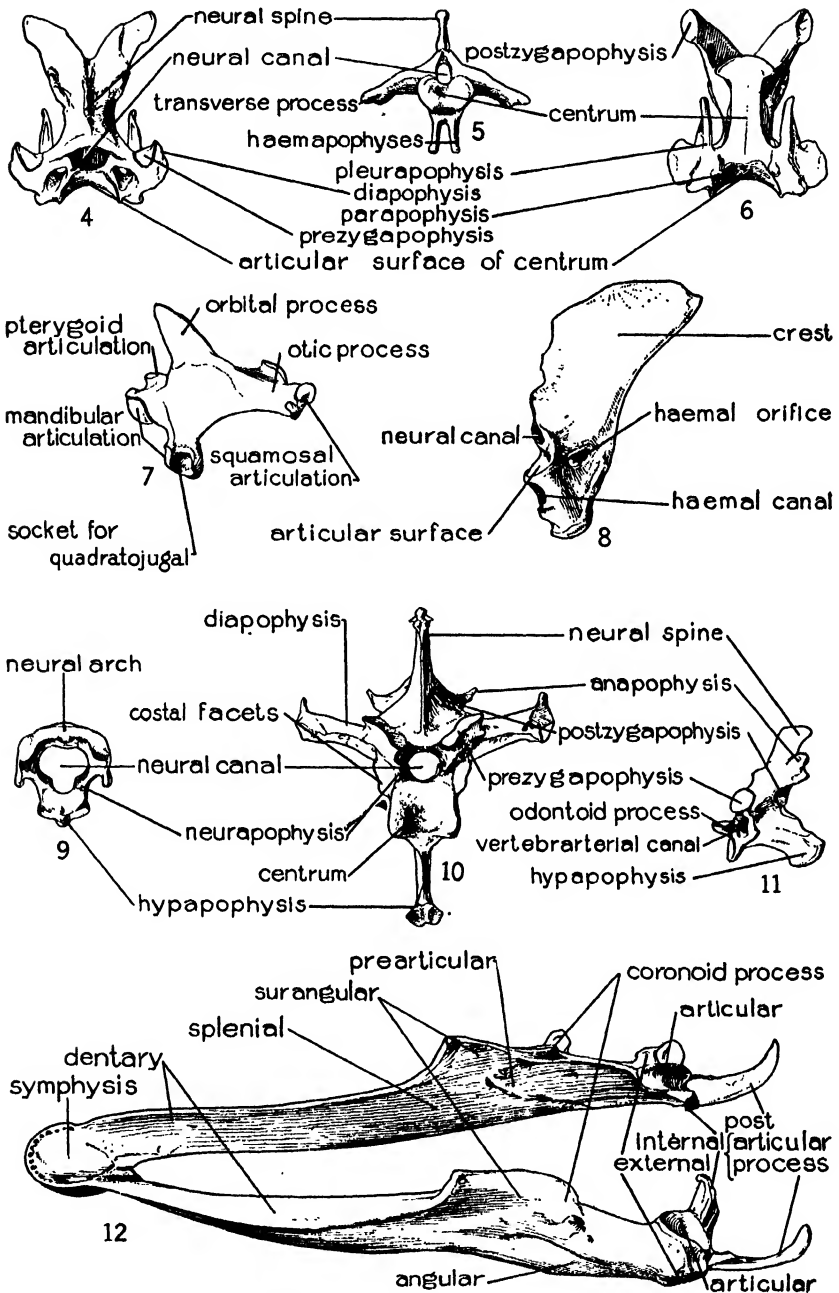
LIST OF SPECIES

Name of species	Number of specimens
<i>Gavia immer</i> (Brünnich)	13
<i>Gavia pacifica</i> (Lawrence)?	1
<i>Gavia stellata</i> (Pontoppidan)	32
<i>Colymbus</i> , probably <i>nigricollis</i> (Brehm)	10
<i>Aechmophorus occidentalis</i> (Lawrence)	15
<i>Podilymbus podiceps</i> (Linnaeus)?	1
<i>Diomedea</i> , probably <i>albatrus</i> Pallas	1
<i>Pelecanus erythrorhynchos</i> Gmelin	1
<i>Pelecanus occidentalis</i> Linnaeus	24
<i>Phalacrocorax auritus</i> (Lesson)	159
<i>Phalacrocorax penicillatus</i> (Brandt)	68
<i>Phalacrocorax pelagicus</i> Pallas	2
<i>Ardea herodias</i> Linnaeus	7
<i>Plegadis guarauna</i> (Linnaeus)	1
Anatidae: unidentified species	2183
<i>Cathartes aura</i> (Linnaeus)	2
<i>Gymnogyps californianus</i> (Shaw)	24
<i>Elanus leucurus</i> (Vieillot)	2

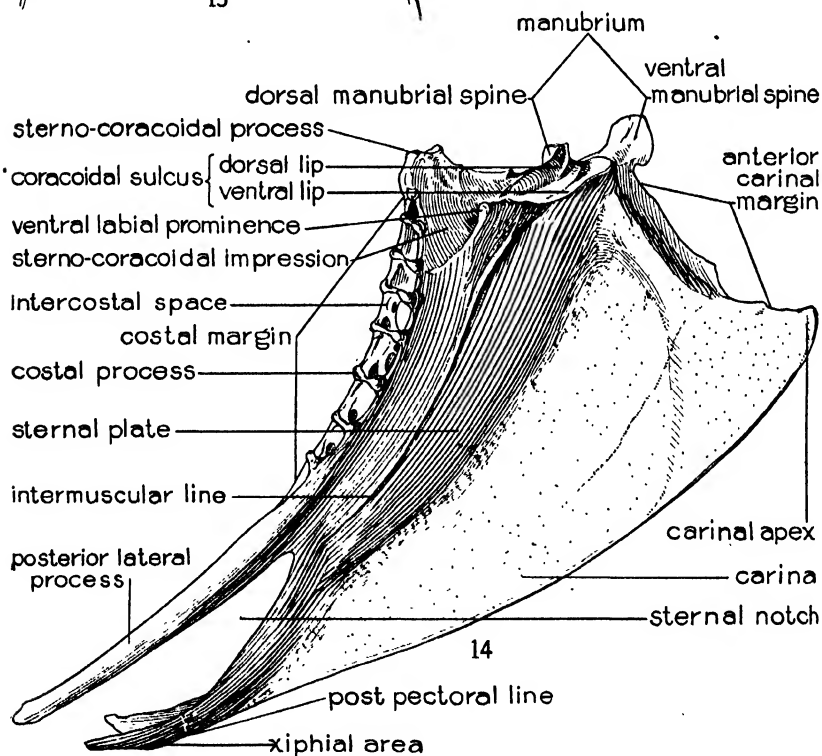
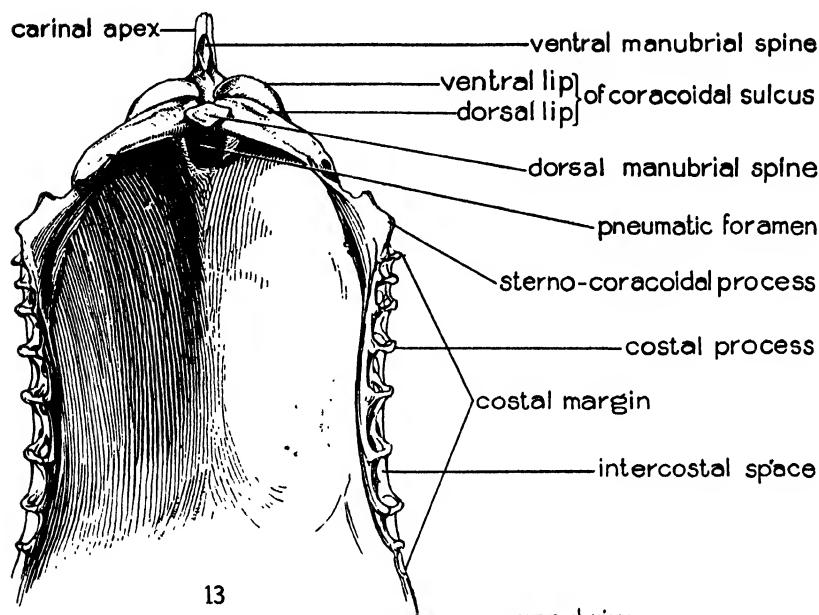
Name of species	Number of specimens
Buteo	35
<i>Buteo borealis</i> (Gmelin)	
<i>Buteo lineatus</i> (Gmelin)	
<i>Buteo swainsoni</i> Bonaparte?	
<i>Buteo lagopus</i> (Brünnich)?	
<i>Buteo regalis</i> (Gray)	
<i>Haliaeetus leucocephalus</i> (Linnaeus)	3
<i>Circus hudsonius</i> (Linnaeus)	1
<i>Falco mexicanus</i> Schlegel	1
<i>Falco peregrinus</i> Tunstall	2
<i>Falco columbarius</i> Linnaeus	1
<i>Lophortyx californica</i> (Shaw)	5
<i>Grus canadensis</i> (Linnaeus)	14
<i>Grus mexicana</i> (Müller)	7
<i>Rallus obsoletus</i> Ridgway	4
<i>Fulica americana</i> Gmelin	7
<i>Squatarola squatarola</i> (Linnaeus)	2
<i>Arenaria</i> sp.	1
<i>Numenius americanus</i> Bechstein	73
<i>Phaëopus hudsonicus</i> (Latham)	1
<i>Catoptrophorus semipalmatus</i> (Gmelin)	6
<i>Pelidna alpina</i> (Linnaeus)	1
<i>Limnodromus griseus</i> (Gmelin)	8
<i>Limosa fedoa</i> (Linnaeus)	9
<i>Recurvirostra americana</i> Gmelin	3
<i>Phalaropus fulicarius</i> (Linnaeus)?	1
<i>Larus</i> sps.	19
<i>Uria troille</i> (Linnaeus)	183
<i>Cephus columba</i> Pallas	1
<i>Ptychoramphus aleuticus</i> (Pallas)	1
Other species of Charadriiformes	39
<i>Tyto alba</i> (Scopoli)	19
<i>Bubo virginianus</i> (Gmelin)	13
<i>Asio</i> sp.	1
<i>Corvus corax</i> Linnaeus	14
<i>Corvus brachyrhynchos</i> Brehm	64
Other species of Passeriformes	2



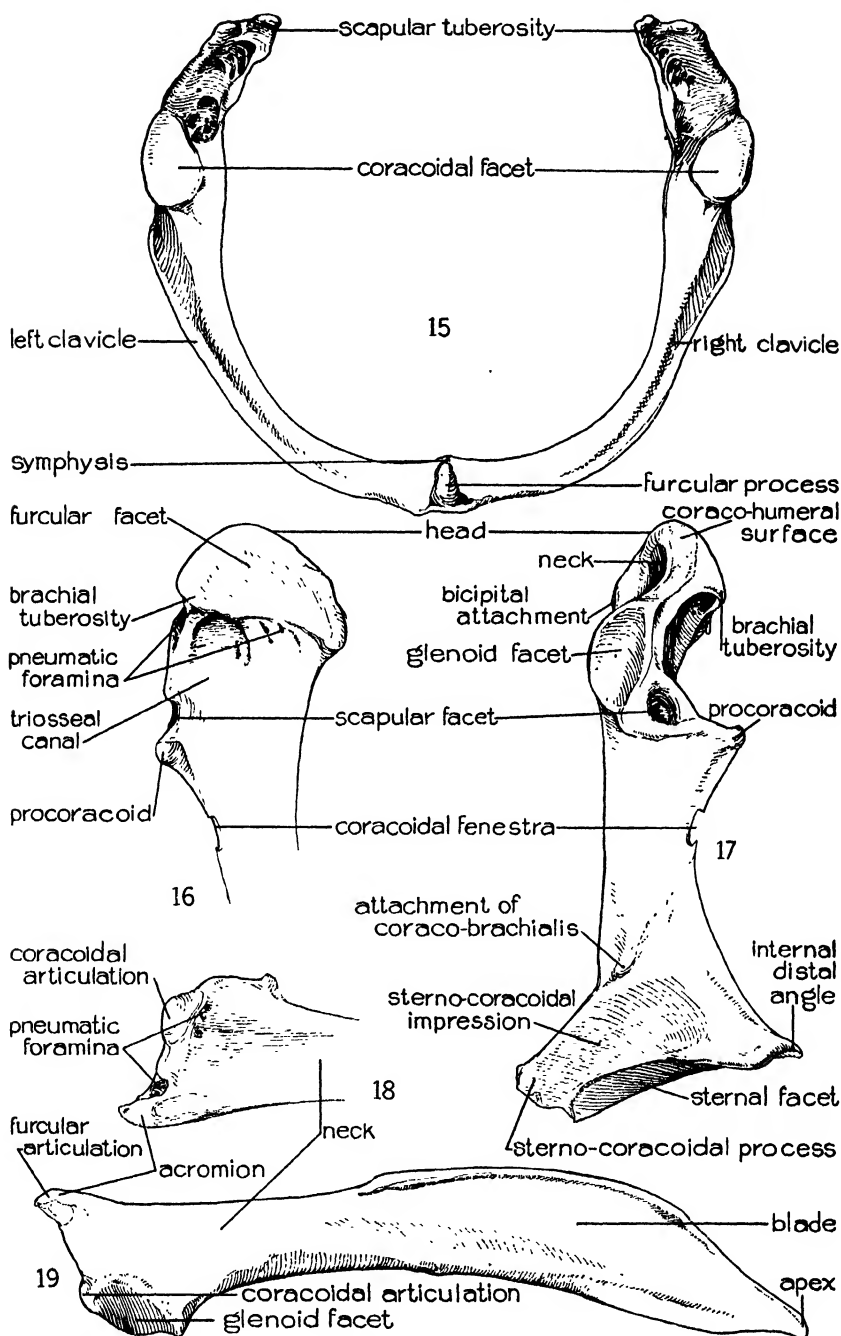
Skull of *Chen hyperboreus*. Fig. 1, dorsal view; fig. 2, ventral view; fig. 3, lateral view. $\times 1$.



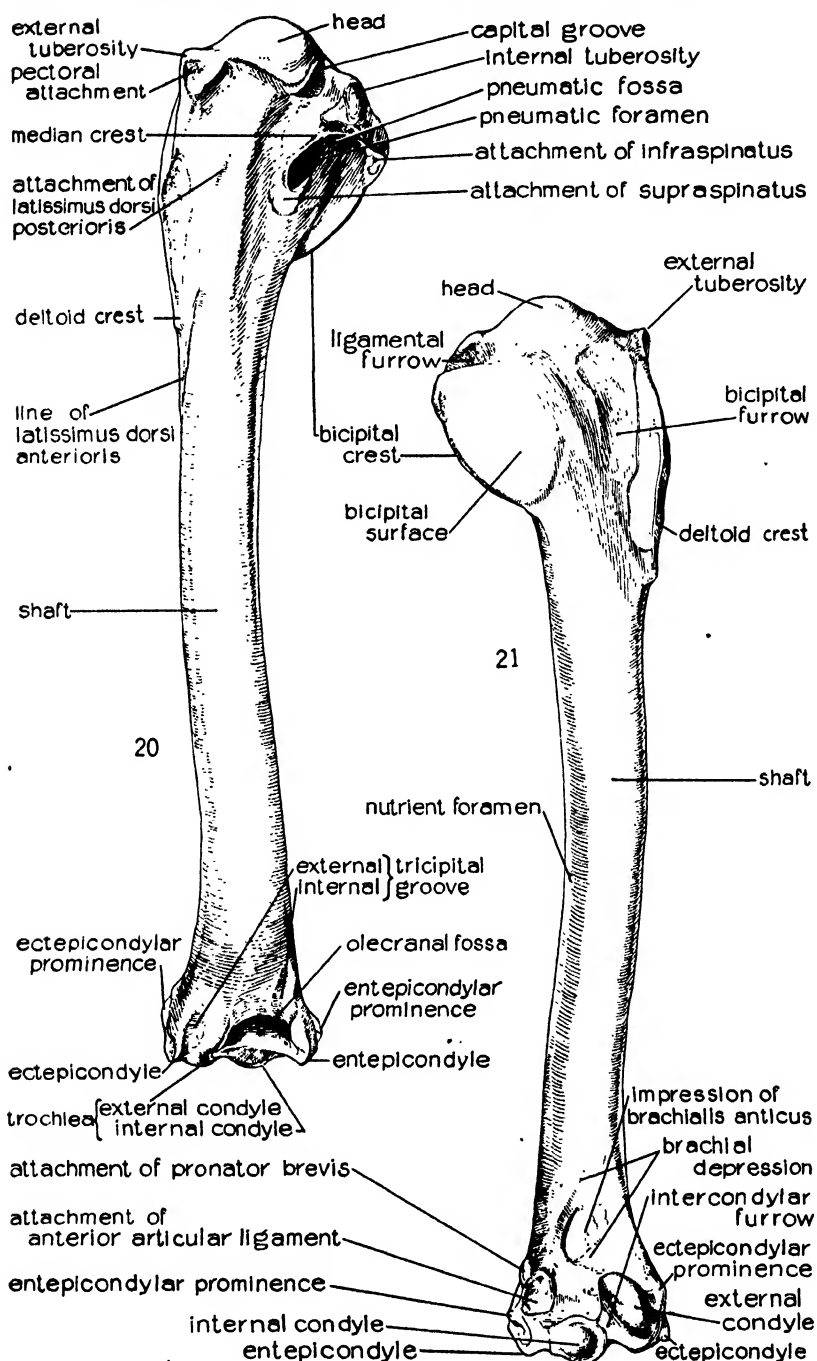
Figs. 4-11, *Aquila chrysaetos*. Fig. 4, 6th cervical vertebra, dorsal view; fig. 5, caudal vertebra, anterior view; fig. 6, 6th cervical vertebra, ventral view; fig. 7, left quadrate, external view; fig. 8, pygostyle; fig. 9, atlas, posterior view; fig. 10, 4th thoracic vertebra, anterior view; fig. 11, axis, left side; fig. 12, *Chen hyperboreus*, mandible. $\times 1$.



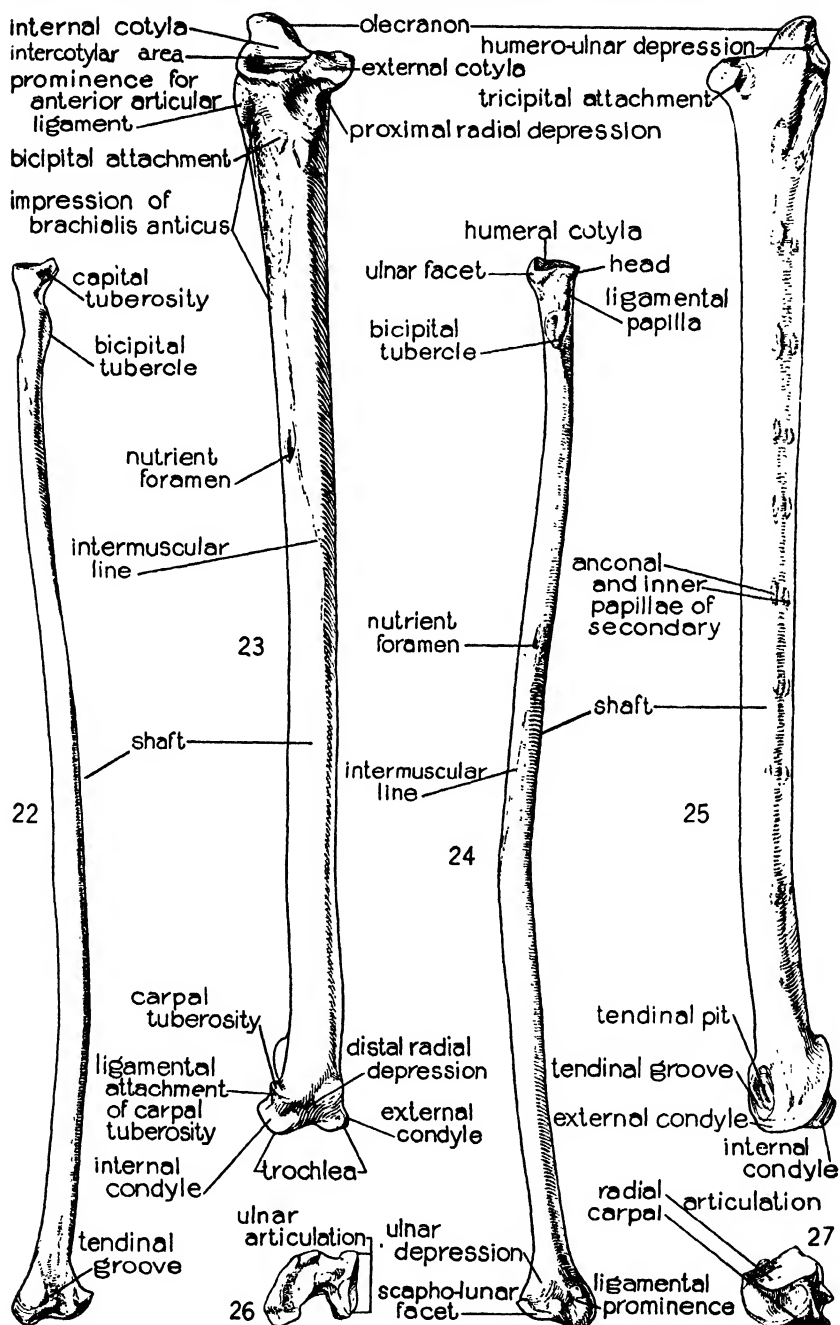
Sternum of *Chen hyperboreus*. Fig. 13, dorsal view; fig. 14, lateral view. $\times 1$.



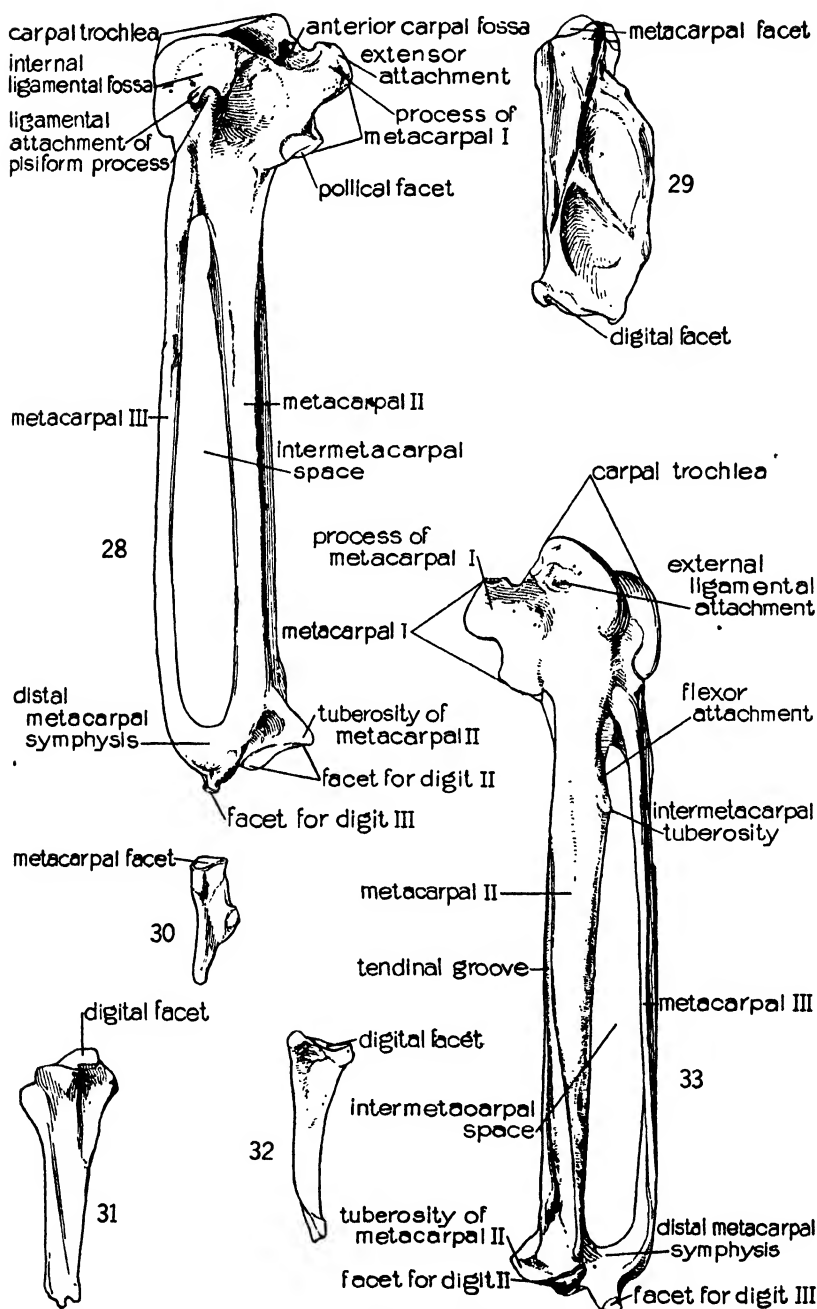
Aquila chrysaetos. Fig. 15, furcula, dorsal view; fig. 16, coracoid, internal view; fig. 17, coracoid, dorsal view; fig. 18, scapula, ventral view; fig. 19, scapula, dorsal view. $\times 1$.



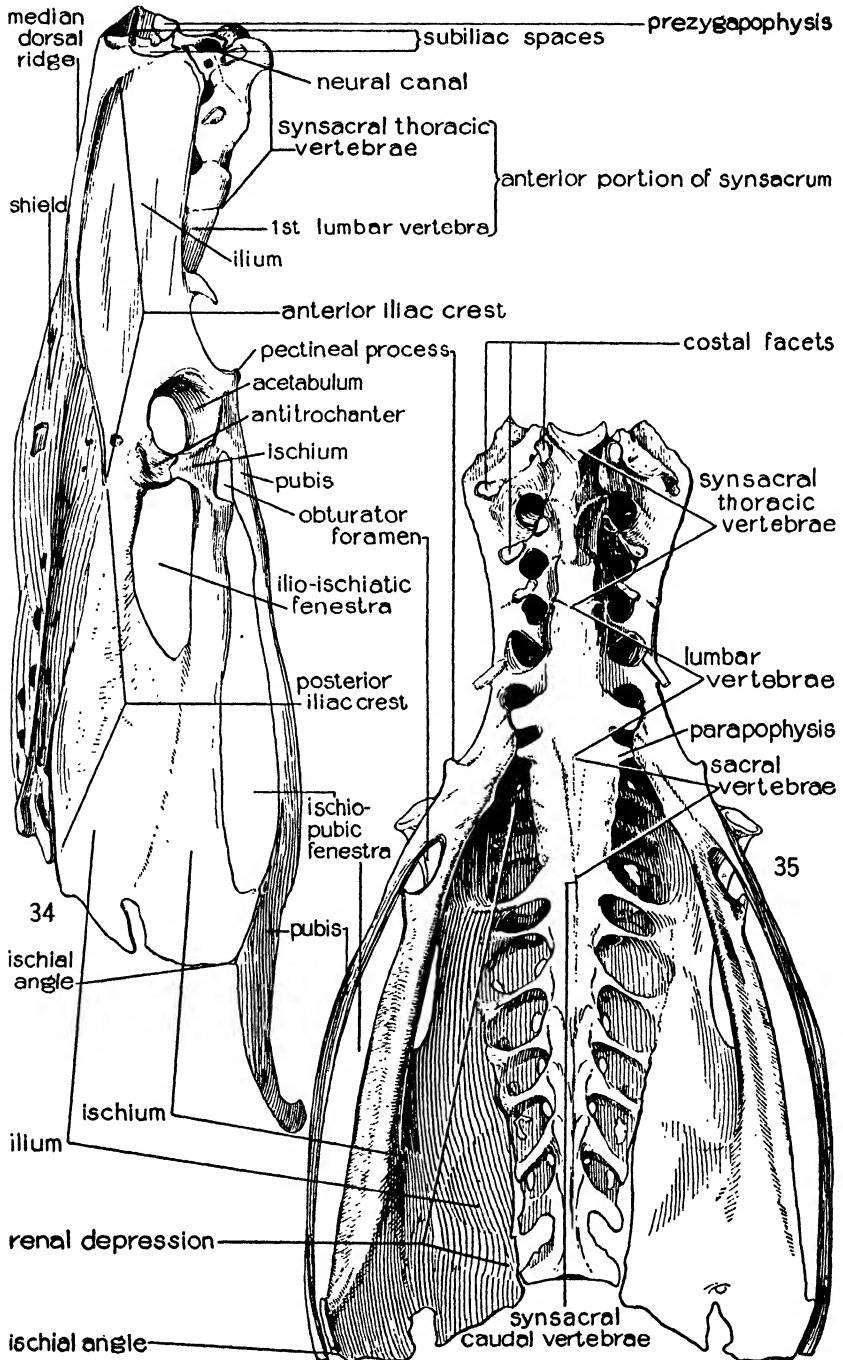
Humerus of *Chen hyperboreus*. Fig. 20, anconal view; fig. 21, palmar view. $\times 1$.



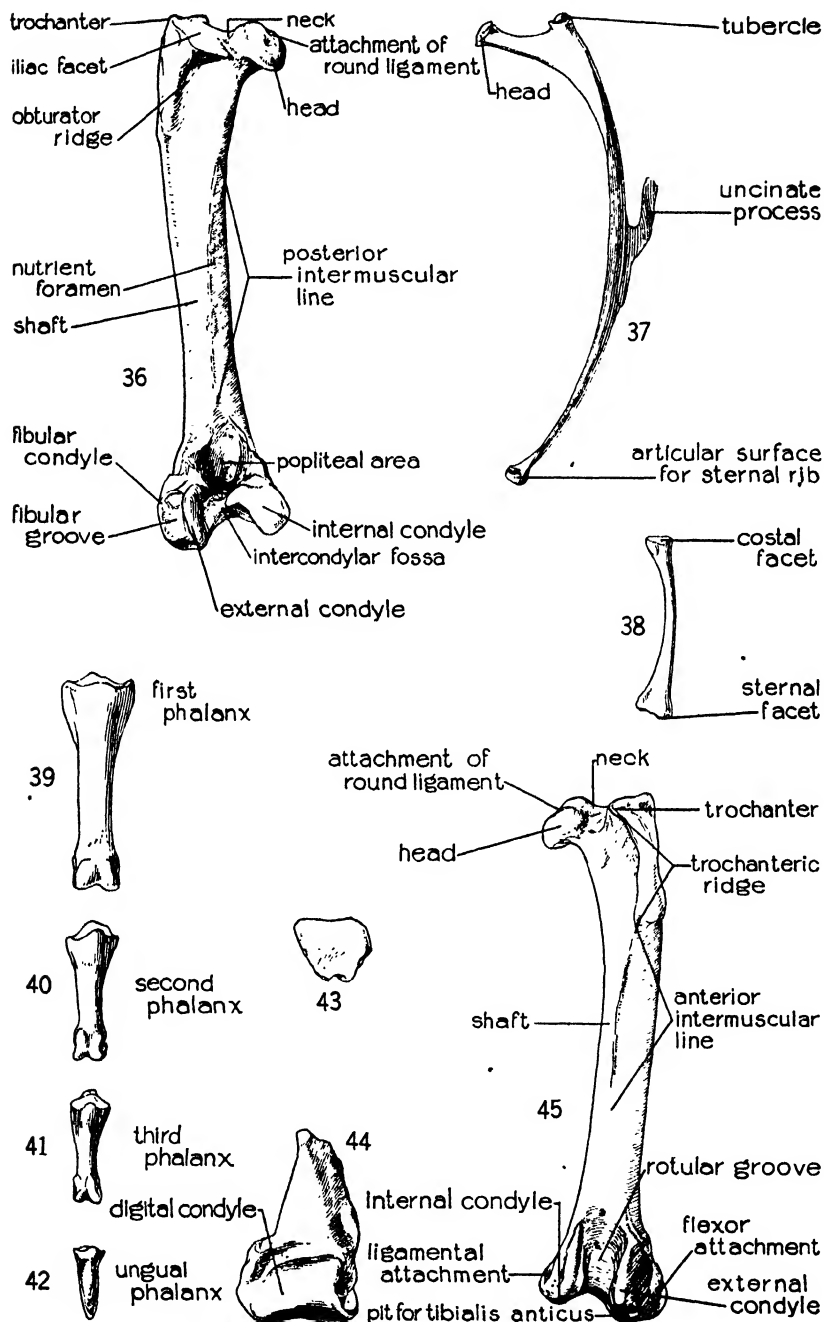
Aquila chrysaetos. Fig. 22, radius, anconal view; fig. 23, ulna, palmar view; fig. 24, radius, palmar view; fig. 25, ulna, anconal view; fig. 26, cuneiform; fig. 27, scapholunar. Figs. 22-25 $\times \frac{2}{3}$; figs. 26-27 $\times 1$.



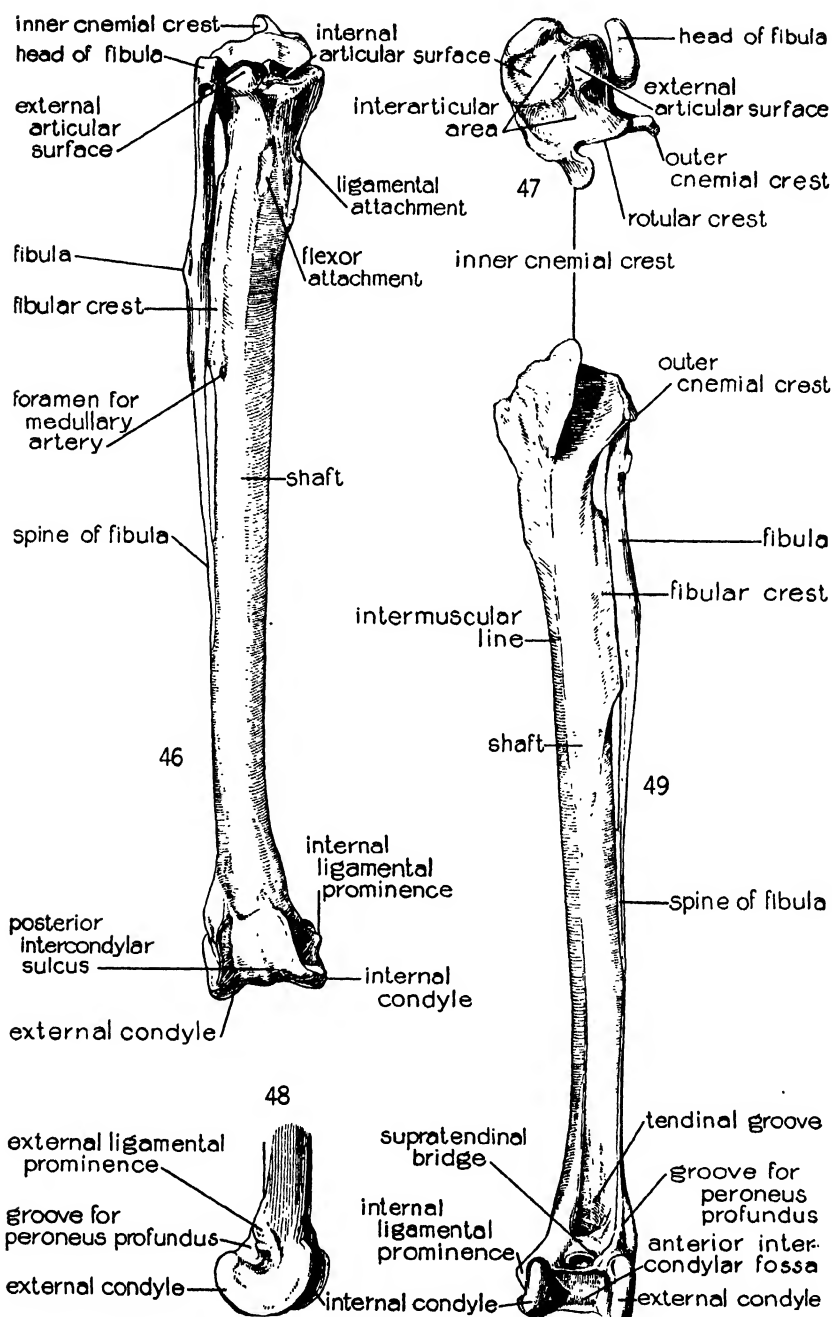
Aquila chrysaetos. Fig. 28, carpometaarpus, internal view. figs. 29-32, phalanges of manus: fig. 29, digit 2, phalanx 1; fig. 30, digit 3; fig. 31, pollex; fig. 32, digit 2, phalanx 2; fig. 33, carpometaarpus, external view. $\times 1$.



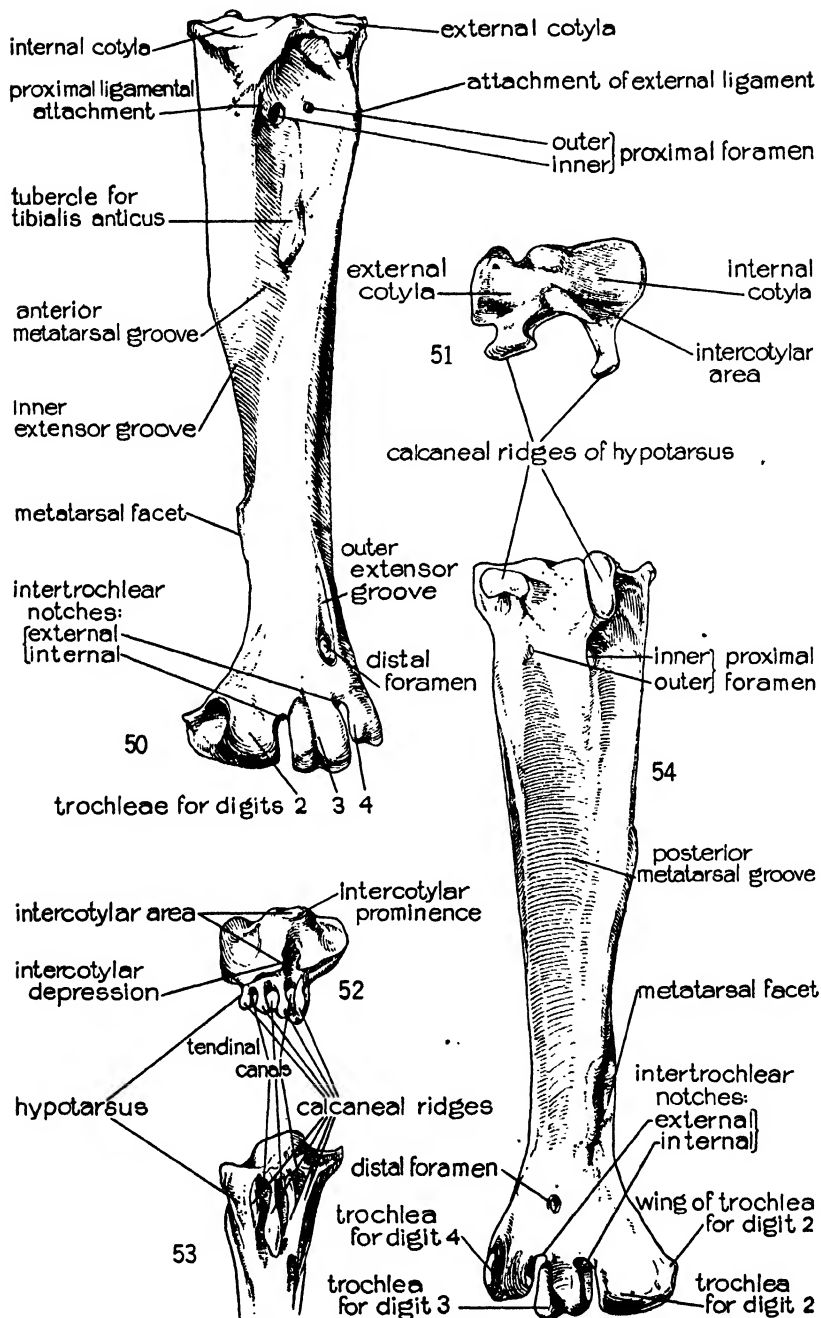
Pelvis of *Chen hyperboreus*. Fig. 34, lateral view; fig. 35, ventral view. $\times 1$.



Figs. 36-42 and fig. 45, *Chen hyperboreus*; figs. 43-44, *Aquila chrysaetos*. Fig. 36, femur, posterior view; figs. 37-38, rib and sternal rib no. 4; figs. 39-42, digit 3 of pes; fig. 43, patella; fig. 44, metatarsal I; fig. 45, femur, anterior view. $\times 1$.



Tibiotarsus and fibula of *Chen hyperboreus*. Fig. 46, posterior view; fig. 47, proximal end, proximal view; fig. 48, distal end, external view; fig. 49, anterior view. $\times 1$.



Tarsometatarsus. Figs. 50, 51 and 54, *Aquila chrysaetos*; figs. 52-53, *Chen hyperboreus*. Fig. 50, anterior view; figs. 51 and 52, proximal end, proximal view; fig. 53, proximal end, posterior view; fig. 54, posterior view. $\times 1$.

DESCRIPTION OF SPECIES

The terms employed in describing the diagnostic characters of the various represented species will be found in the accompanying series of labeled figures, drawn by Mrs. Frieda Abernathy.

The system of nomenclature here set forth was devised by the writer in collaboration with Mr. William H. Burt, of the University of California. Papers by the following authorities were consulted: Fürbringer (1888), Heilmann (1926), Lambrecht (1914), Lowe (1928), Miller (1925*a*, 1925*b*, 1927*a*), Milne-Edwards (1867-68), Owen (1866), Shufeldt (1890, 1909), Stresemann (1927), and Wetmore (1922, 1923). Dr. Miller and Dr. Wetmore were also consulted personally.

The Golden Eagle (*Aquila chrysaëtos*) and the Snow Goose (*Chen hyperboreus*) have been used for illustration. Such parts as cannot well be shown on *Aquila* are labeled on *Chen*, and vice versa. Of the Golden Eagle, Museum of Vertebrate Zoology specimen no. 28884 has been used except for figures 5 and 8, where MVZ no. 40866 was substituted; of the Snow Goose, MVZ no. 45555 has been drawn, except in figure 12 where MVZ no. 22446 has been used.

GAVIIFORMES

Family GAVIIDAE

Material available.—All the main elements of the skeleton with the exception of the femur. The species represented are: *Gavia immer*, *Gavia stellata*, and *Gavia pacifica*?

Gavia immer

This species, easily distinguished from the other species of loon by its large size, is represented by the following elements: sternum, one fragment of costal border; coracoid, one right; humerus, two right, one left proximal half, and one left distal half; ulna, one shaft of right with portion of distal end present; carpometacarpus, one right and one left, nearly complete; synsacrum, lumbar, sacral, and part of the caudal region; tarsometatarsus, one left proximal end, and two right, distal end.

Gavia stellata and Gavia pacifica

The species *G. stellata* and *G. pacifica* have many skeletal characters in common. The following descriptions, therefore, will be concerned with a comparison of the two.

In all but the following three elements the Emeryville specimens exhibit the characters of *stellata* rather than *pacifica*: (1) a posterior portion of right ramus which appears to belong to *pacifica*; (2) a sternum broken in such a manner as to have eliminated the distinguishing characters; and (3) the tarsometatarsus which is so similar in the two species as to make a specific identification impossible.

Rostrum.—One, with maxillary broken on right side: *stellata*. Distinguished from *pacifica* by smaller size and narrower, more deeply cut groove on ventral side, in the premaxillary region. Though young *pacifica* approaches *stellata* in slenderness, the external naris is longer: 29.6 mm. (young *pacifica*), and 25.0 mm. (Emeryville specimen no. 2996).

Mandible.—One posterior portion of left ramus: *pacifica*?. This specimen was identified on the basis of the characters described below, but additional comparative specimens, supposedly of *pacifica*, exhibit variability to such an extent as to approach *stellata*. For this reason the identification, as here given, is questioned.

The characters used for identification are as follows: (1) a fossa on the internal side below the coronoid process is long and narrow in *stellata*; relatively higher in *pacifica*; Emeryville specimen no. 28 measures 11.5 mm. in length and 4.6 mm. in height; (2) external side, a posterior foramen is less closely associated with the external articular process in *stellata* than in *pacifica*.

Sternum.—One anterior end: species indeterminable.

Coracoid.—Three right, one left, complete: *stellata*. Distinguished from *pacifica* as follows: (1) coracoidal fenestra close to margin, often only a notch; (2) scapular facet a deep, smoothly rounded socket.

Scapula.—One right complete; one, right, with coracoidal articulation missing. Both *stellata*, distinguished from *pacifica* as follows: (1) acromion less extended; (2) coracoidal articulation a prominent, rounded ball. These two characters together give the anterior portion of the bone a narrower, less flaring appearance than *pacifica*, lacking, also, the slant of the anterior border from the anterior tip of the glenoid facet to the acromion; (3) distinct notch between acromion and coracoidal articulation.

Humerus.—Two left, proximal half; two left, two right, distal half. All *stellata*, based on the following characters: (1) longer deltoid crest; (2) marked depression distal to head on anconal side; (3) impression of brachialis anticus narrower and with steeper internal border; (4) in general, a smaller bone.

MEASUREMENTS OF HUMERUS

	LENGTH	BREADTH Proximal end	BREADTH Distal end
<i>pacifica</i> (smallest) MVZ No. 49303	mm. 136.3	mm. 19.4	mm. 14.1
<i>stellata</i> (largest) MVZ No. 19034	140.3	18.7	13.1
(smallest) MVZ No. 49330	131.7	18.2	12.5
Emeryville specimens			
8706		18.2	
2461		16.9 _a	
2554			13.3
2525			12.9
2502			12.7
950.			12.5

_a, approximate.

MEASUREMENTS OF ULNA

	LENGTH	DEPTH			
		Proximal end	Below prox- imal end	Above distal end	Distal end
<i>pacifica</i> (smallest) MVZ No. 49303	mm. 111.3	mm. 11.3	mm. 6.6	mm. 8.2	mm. 14.3
<i>stellata</i> (largest) MVZ No. 19034	114.2	10.4	5.8	7.3	12.3
(smallest) MVZ No. 19033	113.0	10.5	6.0	7.1	12.5
Emeryville specimens					
3269	114.8	10.4	6.0	7.3	12.7
10522		8.7 _a	5.5		
10719				7.3	12.0

_a, approximate.

Ulna.—One complete, one proximal, one distal half; all rights: *stellata*. Distinguished as follows: (1) carpal tuberosity not as broad and prominent as in *pacifica* (this character is reflected in a narrower distal end, and also in a narrower carpal tuberosity, proximo-distally, as compared with the broadening in this direction in *pacifica*); (2) in general, smaller size (males of *stellata* may overlap females of *pacifica* in length, but not in depth from anconal to palmar sides).

Radius.—Right, one complete, one distal end; left, one complete. All *stellata* and distinguished from *pacifica* as follows: (1) more slender bone; (2) absence of prominent papilla adjacent to ligamental prominence and between the latter and the distal ulnar depression; (3) distal ulnar depression not so deep.

MEASUREMENTS OF CARPOMETACARPUS

	Length	Greatest breadth proximal end to tip of m. I	Breadth of shaft at middle	Height of distal metacarpal symphysis
Emeryville specimens	mm.	mm.	mm.	mm.
8019	75.0	11.0	3.5	10.7
8054	68.9	10.6	4.1	9.5
1417		11.2	3.7	
8324		10.5		
3168			4.2	9.6

Carpometacarpus.—One left, complete; one right, complete except for metacarpal II; two right, proximal half. These all belong to *stellata*; a fifth specimen, of right distal half, is doubtfully *stellata*. The distinguishing characters follow: (1) external ligamental attachment divided into two depressions of approximately equal size, *pacifica* with one well defined scar followed anteriorly by a broad, indefinite area; (2) comparative slenderness of bone; (3) greater height of distal metacarpal symphysis.

Synsacrum.—One complete except for one or two caudals; one with nearly all caudals missing. Both *stellata*, distinguished from *pacifica* as follows: (1) attachment of caudals to ilium by broad, flat surfaces, approximately equal in size, closely applied to sides of centra; these surfaces in *pacifica* progressively smaller posteriorly and mounted on short processes; (2) a median ventral line, present in Emeryville specimen no. 3614 at caudal vertebra 3, and forking anteriorly in the center of 2, is sometimes present in *stellata*, but is not seen in any available specimen of *pacifica*; (3) lumbar 2 and 3, each with one broad surface of attachment to ilium; two distinct surfaces in *pacifica*; (4) centrum of first synsacral thoracic vertebra notched ventrally.

Tibiotarsus.—Five right and one left, proximal half; one right with rotular crest missing. All *stellata*, based upon two distinct characters: (1) distal end, posterior margin of internal condyle lacking prominent tubercle which characterizes *pacifica*; (2) proximal end,

articular surface on posterior side of rotular crest juts out at an angle and faces downward above the articular surfaces of the tibia, while in *pacifica* this area is continuous with the outer cnemial crest and faces posteriorly, or, if somewhat downward, the region presents a rounded rather than an angular profile.

Tarsometatarsus.—Right, two proximal, two distal half; left, two complete, one complete except for proximal extremity, one proximal, two distal half. *Stellata* or *pacifica*, the two species being indistinguishable.

COLYMBIFORMES

Family COLYMBIDAE

Material available.—Sternum, humerus, ulna, carpometacarpus, synsacrum, femur, tibiotarsus, and tarsometatarsus. The species represented are: *Aechmophorus occidentalis*, *Colymbus (nigricollis?)*, and *Podilymbus podiceps?*.

Aechmophorus occidentalis

The Western Grebe is distinguished from all other species, with the exception of *Colymbus holboellii*, on the basis of size. The following description, therefore, need only be concerned with a comparison of these two species.

Sternum.—One dorsal portion. Ventral lip of coracoidal sulcus not evenly rounded as in *holboellii*, but consisting of an anterior rounded portion separated from the ventral labial prominence by a slight but distinct indentation along margin.

Humerus.—One right, proximal half. Anconal side: (1) external tuberosity with small, well defined pectoral attachment; larger and less well defined in *holboellii*; (2) attachment of supraspinatus large and markedly depressed. Palmar side: (1) ligamental furrow broader than in *holboellii*, and less deeply cut; (2) marginal outline of bicipital crest more evenly rounded than in the latter species, in which the margin is indented just distal to attachment of infraspinatus.

Ulna.—One left, complete; one left, distal half. (1) More slender, and having narrower proximal and distal ends than *holboellii*; (2) proximal end, impression of brachialis anticus bounded anconally by well defined ridge, longer and more proximal in extent than in *holboellii*; (3) a ligamental ridge extending from beneath proximal radial depression diagonally (not straight as in *holboellii*) part way across shaft; (4) distal radial depression more shallow than in *holboellii*; (5) carpal tuberosity forming more obtuse angle with shaft than in *holboellii*.

Carpometacarpus.—One right, complete. (1) More slender than *holboellii*; (2) proximal end, surface between pisiform process and point of separation of metacarpals II and III, straight; *holboellii* with a curving ridge proximally continuous with metacarpal II and running to base of pisiform process; (3) distal end, tuberosity of metacarpal II small, but in *holboellii* prominent.

Synsacrum.—Two. (1) Median dorsal ridge forming a crest immediately anterior to junction of ilia; *holboellii* with dorsal ridge smoothly rounded for a distance of five vertebrae before manifestation of distinct crest; (2) centrum of first synsacral thoracic vertebra broader, more saddle-shaped, and with sides more flaring than in *holboellii*.

Femur.—One left, with distal end missing. (1) Anterior view, area between head and trochanteric ridge divided into two depressed areas, the broader and deeper one near the trochanter and a smaller one, transverse in position, proximal and internal to it; *holboellii* with but one narrow depressed area paralleling the trochanteric ridge; (2) head standing out abruptly from shaft, giving appearance of a transversely broad, but proximodistally short proximal end.

Tibiotarsus.—One left, complete; one left, distal end. (1) Depth of distal end on internal and external sides, relative to greatest breadth of distal end: Six comparative specimens of *occidentalis*, including three individuals, range from 102.9 per cent to 106.2 per cent for external side, and from 101.0 per cent to 102.9 per cent for internal side; two specimens of one individual of *holboellii*, 98.0 per cent and 99.0 per cent for external, and 95.1 per cent and 95.2 per cent for internal; Emeryville specimens, 105.4 per cent and 106.5 per cent for external, and 99.0 per cent and 100.9 per cent for internal; (2) inner side of posterior intercondylar sulcus flaring widely, thus increasing the backward projection of internal condyle over that of *holboellii*.

Tarsometatarsus.—One right, complete; one left, with distal end missing; two left, distal half; one right, with both ends missing. (1) Longer and more slender than *holboellii*; (2) distal end, area between metatarsal facet and trochlea for digit 2 actually, as well as relatively, shorter than in *holboellii*; (3) proximal end, intercotylar depression grading into hypotarsus gradually; in *holboellii*, a decided drop from the depression to the hypotarsus.

Small Grebe

At least one species of small grebe is represented in the Emeryville mound, *Colymbus*, probably *nigricollis*. It is possible that *Podilymbus podiceps* is also present. The genera *Colymbus* and *Podilymbus* can be confused on the basis of size only. Distinction between the two species of *Colymbus*, *auritus* and *nigricollis*, however, is more difficult. In view of their great similarity, and the scarcity of comparative

material, it is not deemed advisable to make a definite statement regarding species, though in several cases, which will be noted, *nigricollis* is apparently the species represented.

Humerus.—One right, distal half. Impression of brachialis anticus narrower than in *Podilymbus: Colymbus*, sp. ?.

Ulna.—One right, with proximal end missing. Distal end broader relative to depth than in *Podilymbus*: Emeryville specimen no. 3315, breadth of distal end 3.7 mm., depth of distal end 3.7 mm.; *Podilymbus*, MVZ no. 28867, breadth 3.6 mm., depth 4.1 mm. *Colymbus*, sp. ?.

MEASUREMENTS OF FEMUR

	a	b	c	d	e	f
	Length	Breadth of shaft	Extent of trochanteric ridge	Depth of fibular condyle	Ratio of c to a	Ratio of d to a
<i>nigricollis</i>						
MVZ No.	mm.	mm.	mm.	mm.	per cent	per cent
49495	34.2	3.2	8.5	6.5	24.8	19.0
49529	31.9	2.9	7.9	6.0	24.8	19.0
49530	31.5	3.1	8.2	5.9	26.0	18.7
<i>auritus</i>						
MVZ No.						
46799	31.7	3.4	7.1	7.0	22.0	22.0
Emeryville specimens						
1535	31.9	3.3	7.7a	6.4	24.1	20.0
2698	31.2	3.2	7.8	5.8	25.0	18.6

a, approximate.

Synsacrum.—Two. Both specimens resemble *Podilymbus* in greater dorsoventral depth of the caudal vertebrae. It may be, however, that this character is a variable one. In the true sacral region, Emeryville specimen no. 3676 is well rounded and has a narrow furrow down the center of the ventral side, as in *Podilymbus*; no. 2219, however, more nearly resembles *Colymbus*, being less rounded (tending to flatten out in the lumbar region) and broadly depressed ventrally. It is possible, therefore, that both *Podilymbus* and *Colymbus* are represented.

Femur.—Two left, complete. (1) Shorter and stockier than *Podilymbus*: Emeryville specimen no. 1535, length 31.9 mm., breadth at middle of shaft, 3.3 mm.; no. 2698, length 31.2 mm., breadth 3.2 mm.; *Podilymbus*, length 37.3 mm., breadth 3.1 mm.; (2) shape of fibular condyle more truncate posteriorly than in *Podilymbus*, the latter roundedly triangular, with the apex of the triangle at the center of the posterior side of the condyle. The table above shows the relationship of the Emeryville specimens to the two species of *Colymbus*; from these figures there appears to be greater similarity with *nigricollis*.

Tibiotarsus.—Two left, complete; one left, proximal half; one right, distal half: *Colymbus*, probably *nigricollis*. Distinguished from *Podilymbus* as follows: (1) more slender shaft; (2) shape of external condyle, elongate anteroposteriorly; in *Podilymbus* nearly as high as long; (3) internal condyle notched on distal margin; (4) outer cnemial crest less projecting, causing rotular crest to be narrower and to lack the triangular appearance of *Podilymbus*. Distinction between *Colymbus nigricollis* and *auritus* rests upon the shape of the rotular crest and outer cnemial crest. The following description is based upon three comparative specimens of *nigricollis*, and only one of *auritus*: (1) anterior surface of rotular crest more trough-like and more pointed proximally in *nigricollis*; (2) margin of outer cnemial crest slightly convex in *nigricollis*, slightly concave in *auritus*.

Tarsometatarsus.—One right, complete. Longer and more slender than *Podilymbus*: Emeryville specimen no. 3222, length 43.0 mm., breadth of shaft 2.3 mm.; *Podilymbus*, MVZ no. 28867, length 37.9 mm., breadth 3.5 mm. One distinguishing character between *nigricollis* and *auritus* appears constant in the three comparative specimens of *nigricollis* and two of *auritus* available. In this character the Emeryville specimen agrees with *nigricollis*: distance of metatarsal facet from distal end greater in *nigricollis*, though the ridge joining the trochlea for digit 2 to the shaft is shorter in the latter species.

PROCELLARIIFORMES

Family DIOMEDEIDAE

Material available.—One left radius, with distal end missing: *Diomedea*, probably *albatrus*. The only specimen of *Diomedea* available for comparison is of this species; this is of a right radius with the proximal end missing. The size and shape of the shaft are similar to the Emeryville specimen, and by holding the two bones together, the intermuscular lines may be made to correspond in such a manner as to indicate that the length is the same. Approximate measurements of the antebrachium on mounted specimens of *Diomedea* show *melanophrys* and *nigripes* to be slightly smaller than *albatrus*, and *exulans* to be decidedly larger.

PELECANIFORMES

Family PELECANIDAE

Materiai available.—All the main elements with the exception of the skull and coracoid. Both *Pelecanus californicus* and *P. erythrorhynchos* are represented, the latter by a single femur.²

Mandible.—One left ramus without articular portion; one right and one left, articular portion only: *californicus*. Distinguished from *erythrorhynchos* as follows: (1) less pneumaticity, the ramus being flat rather than inflated laterally; (2) small pneumatic foramen below articular facet, followed by long, deep fossa; in *erythrorhynchos* this foramen long and extending to edge of articular facet over space occupied by the fossa in *californicus*, also a small fossa present above the foramen; (3) articular facets different in shape.

Sternum.—One fragment of anterior end, belonging to *californicus*, as characterized by absence of broad ventral manubrial spine, the carina extending upward to a point on a line with the ventral lip of the coracoidal sulcus.

Scapula.—One left, without acromion: *californicus*. Distinguished from *erythrorhynchos* by smaller size and by shape of glenoid facet which is narrower, more pointed posteriorly, and convex in surface, rather than flattened.

Humerus.—Four right, proximal end; two right, distal end; all fragmentary: *californicus*. Characterized by (1) smaller size; (2) distal end, attachment of anterior articular ligament narrower and indented marginally by the attachment of the pronator brevis, which, in *erythrorhynchos*, lies anconal to it; (3) furrow between ectepicondylar prominence and external condyle a more distinct channel, deeper than in *erythrorhynchos*, the prominence rising from it as a more abrupt crest; (4) the specimens of proximal end are broken so as to obscure the distinguishing skeletal features, but size is a sufficient basis for identification.

Ulna.—One right and two left, proximal end: *californicus*, distinguished from *erythrorhynchos* on the basis of size.

Radius.—One right, proximal half: *californicus*. Distinguished from *erythrorhynchos* as follows: (1) more slender shaft and smaller head; (2) narrow, distinct furrow on capital tuberosity; (3) ligamental papilla distinct from bicipital tubercle.

Carpometacarpus.—One left and one right, with metacarpal III absent: *californicus*. Distinguished from *erythrorhynchos* by (1) smaller size, and (2) shape of mI, the process of which is more truncate, with notch between it and pollical facet; in *erythrorhynchos*, base of process is at the facet, whence it slopes gradually to its apex.

² Since the above writing, another specimen of *erythrorhynchos*, the distal end of a humerus, has been found in the collection of the Department of Anthropology of the University of California.

MEASUREMENTS OF HUMERUS

	Breadth of proximal end*	Breadth of distal end*
<i>erythrorhynchus</i> (smallest) MVZ No. 22463	mm. 47.3	mm. 40.2
<i>californicus</i> (largest) MVZ No. 19091	40.3	35.0
(smallest) MVZ No. 19092	37.1	31.6
Emeryville specimens 7397	37.8	
2332	37.4	
6760		31.2

* Measurements taken with anconal side against bar.

MEASUREMENTS OF ULNA

	Breadth of proximal end	Depth of proximal end
<i>erythrorhynchus</i> (smallest) MVZ No. 22463	mm. 29.1	mm. 25.3
<i>californicus</i> (largest) MVZ No. 19091	26.5	23.8
(smallest) MVZ No. 49389	23.9	21.8
Emeryville specimens 3310	25.8	
6303	25.6	23.7
7775	24.4	22.1

MEASUREMENTS OF RADIUS

	Length	Depth of head	Breadth of head	Depth of shaft	Breadth of shaft
<i>erythrorhynchos</i> (smallest)					
MVZ No.	mm.	mm.	mm.	mm.	mm.
22463	339.6	13.6	10.2	9.3	7.7
<i>californicus</i> (largest)					
MVZ No.					
19091	357.8	11.0	10.1	7.7	6.6
(smallest)					
MVZ No.					
49390	341.0	10.8	9.6	8.3	6.9
Emeryville specimen					
16311		11.3	10.0	8.3	6.9

MEASUREMENTS OF CARPOMETACARPUS

	Length	Breadth of inner side proximally	Breadth of distal end
<i>erythrorhynchos</i> (smallest)			
MVZ No.	mm.	mm.	mm.
21290	147.7	28.7	16.5
<i>californicus</i> (largest)			
MVZ No.			
19091	136.4	26.8	14.7
(smallest)			
MVZ No.			
49389	121.8	25.5	13.4
Emeryville specimens			
124	123.3	25.3	13.3
547	120.3		12.8

MEASUREMENTS OF FEMUR

	Breadth of proximal end*	Breadth of distal end
<i>erythrorhynchus</i> (smallest) MVZ No. 22463	mm. 31.0	mm. 31.3
<i>californicus</i> (largest) MVZ No. 19091	24.0	26.1
(smallest) MVZ No. 49389	22.5	23.7
Emeryville specimens 8723	28.7 (P.	<i>erythrorhynchus</i> ?)
10582	23.7	
173	22.7	
2634		
10659		23.7
2521		22.3
		22.2a

* Measurement taken with posterior side against bar.
a, approximate.

MEASUREMENTS OF TARSOMETATARSUS

	Breadth of distal end	Depth of distal end
<i>erythrorhynchus</i> (smallest) MVZ No. 21290	mm. 22.1	mm. 17.1
<i>californicus</i> (largest) MVZ No. 19091	21.2	14.8
(smallest) MVZ No. 49389	18.9	13.8
Emeryville specimen 7848	20.5	14.5

Femur.—*Californicus*, one right, proximal half; two right, distal half; one left, with distal end missing; one left, with proximal end missing. *Erythrorhynchos*?, one head of right femur. The two species are distinguished on the basis of size, *californicus* being the smaller.

Tibiotarsus.—One right, distal end: *californicus* as based on size. Breadth of distal end: smallest *erythrorhynchos*, MVZ no. 21290, 21.2 mm.; largest *californicus*, MVZ no. 19091, 17.5 mm.; Emeryville specimen no. 2879, 17.5 mm.

Tarsometatarsus.—One left, distal end: *californicus*; identification based on size.

Family PHALACROCORACIDAE

Material available.—The cormorants (*Phalacrocorax*) are represented by over five hundred determined specimens, including all of the chief skeletal elements. Though the greater part of this material represents juvenile birds, there are enough adult specimens to indicate the occurrence of three different species: *Phalacrocorax auritus*, *P. penicillatus*, and *P. pelagicus*. Specimens of the latter, however, are limited to a single fragment of tibiotarsus and a complete femur.

Cranium.—Two of *penicillatus*, based upon a narrower groove, between the posterior border of the brain case and the occipital crest, than in *auritus*.

Rostrum.—Three of *auritus*, distinguished from *penicillatus* in being shorter, higher, and heavier.

Mandible.—*Auritus*, one left, anterior portion; one right and four left, posterior portion; *penicillatus*, one left, anterior portion; two right and one left, posterior portion. The two species are distinguished as follows: (1) *auritus* shorter, broader, and sturdier; (2) articular region with little knob at anterior edge of articular facet, not present in *penicillatus*; (3) pneumatic foramen on inner side smaller and farther removed from inferior border in *auritus*.

Sternum.—Thirteen specimens, all too fragmentary to exhibit the distinguishing specific characters.

Furcula.—Four dorsal ends, one right and one left, of *auritus*, and the same of *penicillatus*. Distinguishing characters: (1) external side, muscle scar below coracoidal facet flattened in *auritus*, but raised into a papilla in *penicillatus*; (2) internal side, an intermuscular line up shaft approaches posterior border more abruptly (more at an angle) in *auritus*, than in *penicillatus*.

Coracoid.—*Auritus*, ten right, eight left; *penicillatus*, one right, three left. Distinguishing characters: (1) head thickened in antero-external diameter in *auritus*, thinner in *penicillatus*; (2) procoracoid broadly rounded in *auritus*, and also not meeting shaft in the form of a crest as in *penicillatus*.

Scapula.—*Auritus*, six right, five left; *penicillatus*, two right, two left. Specific differences lie in the acromial region: internal margin of acromion evenly rounded from blade to dorsal tip in *auritus*, angular in *penicillatus*; the surface for the scapular head of the triceps extends into a notch between the border of the furcular articulation and the internal margin of the acromion; this notch absent in *auritus*.

Humerus.—*Auritus*, two right and one left, complete; three right and five left, proximal half; twelve right and ten left, distal half; *penicillatus*, six right and three left, proximal half; three right and two left, distal half. The following characters of *auritus* distinguish it from *penicillatus*: (1) distal end, impression of brachialis anticus markedly depressed distally; (2) olecranal fossa less sharply margined; (3) proximal end, anconal side, capital groove with steeper sides; (4) palmar side, bicipital furrow less rugged proximally.

Ulna.—One right and five left, complete; one right, with distal end missing; four right and five left, proximal half; four right and three left, distal half. The characters of this element exhibit so much variation that it would be unwise to attempt to separate the two species, *auritus* and *penicillatus*, with but a single comparative specimen of *auritus*. *Pelagicus* is excluded on the basis of size.

Radius.—*Auritus*, one right and one left, complete; four right and two left, proximal half; six right and one left, distal half; *penicillatus*, one left, complete; three right and two left, proximal half; one right and two left, distal half. Distinguishing characters: (1) proximal end, capital tuberosity, in *auritus*, a thin process proceeding in a straight line from edge of humeral cotyla; in *penicillatus*, broader, less prominently projecting, and lying slightly below edge of cotyla; (2) distal end, in *auritus*, palmar side of shaft immediately proximal to ligamental prominence depressed; in *penicillatus*, this region rounded.

Carpometacarpus.—*Auritus*: four right, four left (one right without distal end, one left without proximal end, others complete); *penicillatus*, one right, complete; one right with proximal end missing. Distinguishing characters: (1) posterodistal limit of internal articular ridge of carpal trochlea more sharply defined in *auritus*, and (2) tubercle at same limit of the parallel articular ridge more sharply defined also; (3) distal end, intermetacarpal space narrower in *auritus*, due to straighter metacarpal III.

Pelvis.—*Auritus*, thirteen; *penicillatus*, three (all specimens fragmentary, central portion of synsacrum with ilia attached). Distinguishing characters: (1) an iliac process dorsal to antitrochanter broader, less irregular, and not continuing posteriorly, in *auritus*; in *penicillatus* it is in the form of a small irregular tubercle, or series of rugosities, continuous posteriorly with a posterior iliac crest; (2) antitrochanter less prominent in *auritus* than in *penicillatus*; in the latter the ilia narrow decidedly behind the antitrochanter, making it appear more prominent.

Femur.—*Auritus*, fifteen right and four left, complete; two right, proximal half; five right and one left, distal half; *penicillatus*, four

right, complete; one left, proximal half; one right, distal half; *pelagicus*, one right, complete. *Auritus* and *penicillatus* distinguished as follows: (1) a thinner bone in *auritus*, with (2) posterior aspect of trochanter less deeply rugose, particularly notable in attachment of external obturator, which is almost pit-like in its proportions in *penicillatus* as compared with an indistinct impression in *auritus*; (3) anterior aspect of proximal end less markedly depressed in *auritus*, with depression limited in extent to inner side of trochanteric ridge, and not extending from trochanter to head as in *penicillatus*; (4) distal end, relative depths of external and fibular condyles, in *auritus* external condyle 1 mm. to 1.2 mm. deeper than fibular condyle; in *penicillatus* 1.5 mm. to 2 mm. deeper (measured with anterior face of internal side at distal end flat against jaw of calipers, and distal end against bar). *Pelagicus* characterized by (1) its small size (49.7 mm. in length, as contrasted with about 56 mm. to 63 mm. for the other two species); (2) resemblance to *auritus* at proximal end (numbers 2 and 3 above); and (3) resemblance to *penicillatus* in relative depths of external and fibular condyles (number 4 above).

Tibiotarsus.—*Auritus*, four left, complete; one right, proximal half; two right and three left, distal half; *penicillatus*, one right, proximal half; one right and one left, distal half; *pelagicus*, one right, distal half. *Auritus* and *penicillatus* distinguished as follows: (1) proximal end, border of internal articular surface of *auritus* rounding to a point posteriorly instead of straight as in *penicillatus*; (2) outer cnemial crest lacking overhanging point in *auritus* which is present in *penicillatus*; (3) distal end, internal side of shaft above internal ligamental prominence, in *auritus*, straight for a short distance before curving inward; in *penicillatus* the shaft curves in immediately above the ligamental prominence; (4) external condyle in *auritus* with heavier posterior border; this portion flange-like in *penicillatus*. *Pelagicus* characterized by its small size (breadth across condyles 10.4 mm., depth of internal condyle 9.9 mm.).

Tarsometatarsus.—*Auritus*, three right and seven left, complete; one left, proximal half; two right, distal end; *penicillatus*, two left, complete; one left, complete but for part of proximal end; one right, with parts of both ends missing; one right, distal half. Distinguishing characters: (1) proximal end, marked depression between posterior border of internal cotyla and hypotarsus absent in *auritus*, but present in *penicillatus*; (2) distal end, trochlea for digit 4 less prominent in *auritus*, projecting anteriorly in *penicillatus*. One small Emeryville specimen, measuring 55.6 mm. in length, is larger than the largest comparative specimen of *pelagicus* available (51.8 mm.) and furthermore resembles *penicillatus* in both of the characters mentioned above; *pelagicus* resembles *auritus* at the proximal end, and *penicillatus* at the distal end.

CICONIIFORMES

Family ARDEIDAE

Material available.—*Ardea herodias* is represented by the following elements: scapula, carpometacarpus, femur, and tarsometatarsus. This species could not be confused with any other of the family Ardeidae, due to its larger size, but there is a possibility of confusion with *Mycteria americana* of the related family Ciconiidae. The descriptions which follow distinguish between *Ardea* and *Mycteria*.

Scapula.—One right and one left anterior end, distinguished from *Mycteria* as follows: (1) margin of glenoid facet straight rather than rounded; (2) surface of same, flat to concave; (3) coracoidal articulation immediately adjacent to glenoid facet, not a separate prominence as in *Mycteria*.

Carpometacarpus.—One complete left, distinguished from *Mycteria* as follows: (1) longer and more slender; (2) proximal end, pisiform process obliquely proximal in direction instead of pointing anteriorly as in *Mycteria*; (3) process of metacarpal I as viewed from internal side, proceeding directly from proximal rounded edge of pollical facet without intervening notch which is present in *Mycteria*; (4) distal end, metacarpal III in symphyseal region rounding gradually to top of facet for digit III, but in *Mycteria* turning in abruptly, leaving a broad notch between its extremity and the facet; (5) anterior margin of facet for digit II bordered proximally by a triangular tubercle with apex above the margin of the facet, and two distinct papillae internal to it; tubercle present in *Mycteria*, though with apex on the margin of the facet, and papillae only indistinctly outlined, or absent. Length: *Ardea*, MVZ no. 12710, 101.4 mm.; *Mycteria*, MVZ no. 24920, 94.0 mm.; Emeryville specimen no. 934, 104.7 mm.

Femur.—Two left, proximal half. Distinguished from *Mycteria*: (1) relatively more slender; (2) trochanter not extending proximally beyond iliac facet.

Tarsometatarsus.—Two left, distal end. Though approximately equal in size in *Ardea* and *Mycteria*, this element is not apt to be confused in the two genera. In *Ardea* the distal end is straight transversely, with the trochleae approximately in a line, the distal foramen is small, and the metatarsal facet nearer the distal end.

Family THRESKIORNITHIDAE

Material available.—One shaft of right tarsometatarsus of *Plegadis guarauna*, distinguished from members of the family Ardeidae by depressed condition of anterior side of shaft, with two parallel straight ridges forming the margins. Breadth of shaft 4.0 mm.

ANSERIFORMES

Material available.—All of the main skeletal elements. The anserines represent nearly two-thirds of all the bird bones identified in the mound, the number of specimens being about 2200. Over two-thirds of the anserine bones are of ducks.

The order Anseriformes includes so large a number of species, each species exhibiting great individual variation, that a large series of modern specimens for comparison would be necessary before an adequate specific identification could be undertaken with safety. No such series is available. For the purpose of the present study, it is sufficient merely to note the great preponderance of anserines; such an occurrence, of course, is to be expected in dealing with a people inhabiting the Bay shore.

FALCONIFORMES

Family CATHARTIDAE

Gymnogyps californianus

Material available.—Right and left quadrate; three fragments of mandible; eleven vertebrae; ventral portion of furcula; proximal end of left coracoid and all except proximal end of right coracoid; anterior end of right scapula; right cuneiform; first phalanx of digit 2 of left wing; right and left tibiotarsi.

All the specimens, with the exception of the wing phalanx, were collected within the same small area, and are apparently all from the same individual.

There is nothing with which to confuse *Gymnogyps*, though on the basis of size there is a similarity with the Pelecanidae. Its falconiform characters, however, remove all possibility of error in that direction.

Cathartes aura

Material available.—Distal half of left radius; and a synsacrum.

Radius.—This element is about the width of that of *Aquila*, though the cathartid bone is a shorter one. *Cathartes* is easily distinguished from the Accipitridae, however, by its greater pneumaticity, several pneumatic openings of indefinite arrangement being present at the distal end on the palmar side; the shape of the distal end is different in *Cathartes*, also, due to a less developed ligamental prominence.

Synsacrum.—This element shows the same tendency to curve ventrally in the caudal region, as is the case in the Accipitridae, though to a lesser degree. However, on the basis of size alone, *Cathartes* is distinguishable from the members of this family, being smaller than *Aquila*, but larger than *Buteo*. Other distinctions lie in a decidedly perforate shield, and the more dorsal attachment of the thoracic and lumbar vertebrae to the ilia, with consequent lengthening of the parapophyses in these regions.

Family ACCIPITRIDAE

EAGLES

Material available.—Of the eagles, *Haliaeetus leucocephalus* alone is represented, and that only by humerus and carpometacarpus, three specimens in all. The two bones for which data are available, are from widely separated areas of the mound.

Humerus.—Right proximal half. Distinguished from *Aquila chrysaetos* as follows: (1) distal half of margin of deltoid crest markedly indented, but in *Aquila* nearly straight; (2) pneumatic fossa broader and of less distal extent, the end of the median crest being well proximal to the end of the bicipital crest; (3) internal margin of bicipital crest rounded; in *Aquila* rounded distally, then proceeding in an almost straight line proximally and slightly in an internal direction.

Carpometacarpus.—Two left, complete, distinguished from *Aquila* as follows: (1) pollical facet roughly oval, lacking the distinct notching on its anterior and posterior margins which in *Aquila* tends to divide the facet into two surfaces; (2) pisiform process less projecting than in *Aquila*; (3) proximal margin of anterior side of trochlea flattened in *Haliaeetus*, but convex in *Aquila*.

HAWKS

Material available.—Cranium, sternum, coracoid, humerus, ulna, carpometacarpus, synsacrum, femur, tibiotarsus, and tarsometatarsus, representing the following genera: *Buteo*, *Circus*, and *Elanus*.

Buteo

The buteonid hawks occurring in California are six in number, ranging in size from large to small, as follows: *Buteo regalis*, *B. borealis*, *B. lagopus*, *B. swainsoni*, *B. abbreviatus*, and *B. lineatus*, each of which, however, tends in some elements to overlap in size with one or two other species at the extremes. This overlapping in size, together with the great similarity in osteological characters between

species and the variability within a species, makes it unsatisfactory to attempt species identification without a large number of specimens for comparison. In certain instances distinct differences are apparent, and here specific identification has been ventured. All such identification, however, is offered tentatively.

Cranium.—One, fragmentary. Larger than *lagopus* and *swainsoni*.

Sternum.—One, anterior end, and carina, of *borealis* based upon shape of ventral manubrial spine, which is irregularly triangular with base tending to flare, height more than 1 mm. greater than base (of

MEASUREMENTS OF CORACOID

	Length		Length
<i>regalis</i>		<i>swainsoni</i>	
MVZ No.	mm.	MVZ No.	mm.
41189	50.7	41407	38.3
29002	44.5	41408	36.0
<i>borealis</i>			
MVZ No.			
49601	47.3		
40424	40.4	Emeryville	
		specimens	
<i>lagopus</i>		2237	44.6
MVZ No.		2234	41.6
39693	41.8	6366	39.2a
40366	39.6		

a, approximate.

nine comparative specimens of *borealis*, the means of height and breadth of base are respectively 5.5 mm. and 3.9 mm., with extremes of 6.3 mm. by 3.5 mm., and 5.4 mm. by 4.2 mm.) ; in *regalis*, base more flaring and height 1 mm. greater to more than 1 mm. less than base (of nine comparative specimens of *regalis*, the means of height and breadth are respectively 5.2 mm. and 5.7 mm., with extremes of 7.0 mm. by 6.0 mm. and 3.6 mm. by 5.3 mm.) ; distinguished from *lagopus* in having flare at both sides of base, and not straight-sided; distinguished from *swainsoni* in position of spine, which in the latter species is more projecting, with the apex perceptibly anterior to the base. Measurements of ventral manubrial spine of Emeryville specimen no. 9884, height 5.3 mm., breadth at base 4.1 mm.

Coracoid.—Three right, complete except for slight chipping at ends; no. 2234 and no. 6366 may be either *borealis* or *lagopus*, and no. 2237 either *borealis* or *regalis*, on the basis of size. Two left, with anterior end missing: species?. The table above gives extremes of available comparative material for each species named.

Humerus.—Three right, one left, proximal half; two left, distal half. Three of the specimens of proximal half agree with *borealis* in depth of head relative to breadth of proximal end. Specimens of distal half are distinct from *regalis* in shape of impression of brachialis anticus, which is triangular, with its base broader than its external side; in *regalis* the opposite is true; furthermore, the sides of the

triangle tend to be slightly convex outward, but in *regalis* are straightened. Distinction between *borealis*, *lagopus*, and *swainsoni* cannot be made on the basis of this impression, but, on the basis of size, no. 7838 apparently falls in with *borealis*, though no. 2575 may be any one of the three. The one available comparative specimen of

MEASUREMENTS OF HUMERUS

	^a Breadth of proximal end	^b Depth of head	^c Ratio of <i>b</i> to <i>a</i>	^d Breadth of distal end
<i>regalis</i>				
MVZ No.	mm.	mm.	per cent	mm.
41189	25.3	7.4	29.2	22.1
27570	21.6	6.1	28.1	18.8
<i>borealis</i>				
MVZ No.				
41230	23.9	6.0	25.1	21.0
40424	20.0	5.4	27.0	.
41250	19.6	5.0	25.5	17.4
<i>lagopus</i>				
MVZ No.				
40366	20.8	5.6	26.9	18.0
<i>swainsoni</i>				
MVZ No.				
41407	19.3	5.1	26.4	17.5
41408	18.3	4.8	26.2	16.4
<i>abbreviatus</i>				
L. H. Miller				
Coll. No.				
678	18.3	5.3	28.8	17.1
639	18.5	5.2	28.1	
<i>lineatus</i>				
L. H. Miller				
Coll. No.				
580	16.6	4.7	28.3	15.4
Emeryville specimens				
7788	23.1	5.7	24.2	
2851	22.7	5.9	25.9	
9940	21.1	5.7	27.0	
10270	21.0	5.1	24.2	
7392	17.3	4.8	27.7	
7838				20.3
2575				17.5

lineatus falls well below the other species in size. The two specimens of *abbreviatus* (one complete, one proximal end) correspond in size, but are not to be considered, due to (1) more gradually rounded bicapital crest and (2) impression of brachialis anticus with straighter sides and base. The table above gives extremes for both proximal and distal ends.

Ulna.—Two left, complete; one right, one left, proximal half; one left, distal half. The following table gives the measurements of each Emeryville specimen and comparative specimens available, with the

exception of *borealis* and of *Circus hudsonius* of which the extremes alone are listed, and of *Accipiter cooperii* of which only the largest available specimen is given. No definite conclusions can be drawn from these data since no specimens of *lineatus* or of small (male) *regalis* are available (the small individuals in the MVZ collection lack

MEASUREMENTS OF ULNA

	Length to top of external cotyla	Breadth of proximal end	Breadth of distal trochlea*	Breadth of middle of shaft
<i>regalis</i>				
MVZ No.	mm.	mm.	mm.	mm.
41409	149.0	14.8	9.4	7.0
41189	147.2	14.6	9.2	6.7
<i>borealis</i>				
MVZ No.				
41230	135.3	13.5	9.1	6.4
41250	122.7	11.5	7.6	5.8
<i>lagopus</i>				
MVZ No.				
40366	121.4	12.3	8.0	6.0
<i>swainsoni</i>				
MVZ No.				
41407	119.1	11.9	7.4	5.1
41408		11.1	7.3	5.5
<i>abbreviatus</i>				
L. H. Miller				
Coll. No.				
678	118.7	11.5	7.6	5.2
<i>Circus hudsonius</i>				
MVZ No.				
41224	110.5	10.6	7.1	5.1
40414	105.7	10.2	7.0	5.0
<i>Accipiter cooperii</i>				
MVZ No.				
41405	80.8	9.2	5.9	4.7
Emeryville specimens				
5311	96.9	10.5	6.9	5.3
1437	92.3	9.6	6.3	4.9
10730		12.7		6.1
8576		12.5		6.4
11316			6.7	5.3
8366			5.6	4.1

* Measurement taken with internal side flat against jaw of calipers.

this element). Nos. 8576 and 10730 fall within the extremes of *borealis*, but were more specimens of *regalis* present, might agree with that species as well. Nos. 5311, 1437, 8366, and 11316 are smaller than any buteonid hawk listed. Since, however, they fall between *abbreviatus* and *Accipiter cooperii*, and since, also, the one available humerus of *lineatus* from the collection of L. H. Miller lies in the same relative position with regard to the species named, it seems likely that the four Emeryville specimens are of *lineatus*.

Carpometacarpus.—Three left, one right (one left, with trochlea missing). From the following table of measurements of length, the Emeryville specimens may be seen to fall within the range in size of *borealis*. It is possible that, were more specimens of *swainsoni* and *lagopus* available, one or both of these species might be found to reach a size equal to that of the Emeryville specimens. Regarding *regalis*, however, though the two specimens are both of large (probably female) birds, it is doubtful if this species has a range of size sufficient to include the Emeryville measurements.

Synsacrum.—Two fragments, apparently of *borealis*, based upon height relative to breadth of centrum of first synsacral thoracic vertebra. Actual size excludes *swainsoni*, and probably *lagopus*, and relative size excludes *regalis*, as well as *lagopus*.

MEASUREMENTS OF CARPOMETACARPUS

		Length			Length
<i>regalis</i>	MVZ No.	mm.	<i>swainsoni</i>	MVZ No.	mm.
	40419	77.0		41407	62.1
	41189	75.9		41408	59.8
<i>borealis</i>	MVZ No.		Emeryville specimens		
	41230	68.0			
	41250	61.9			
<i>lagopus</i>	MVZ No.			11347	64.7
	40366	62.7		5789	63.7
				3135	63.3

Femur.—Two left, complete, probably *borealis*, judging from size alone. A table (page 347) gives extremes of available specimens of each species.

Tibiotarsus.—One right, one left, proximal half, too large for *lagopus* or *swainsoni*; falls within limits of *regalis*. One left, distal end, too large for *lagopus* or *swainsoni*, and distinguished from *regalis* by character of surface on posterior side between margin of internal condyle and edge of shaft; in *borealis* this area narrower and more rounded than in *regalis*, in which latter species it is flattened and somewhat depressed; the Emeryville specimen resembles *borealis*. A table (page 348) gives extremes of available comparative specimens.

One right, distal end, of small *Buteo*. Though size is like *Circus hudsonius* or *Accipiter cooperii*, the bone is distinctly buteonid, as indicated by the depressing of the area above the condyles on the anterior side, the supratendinal bridge being relatively flat and long, not bowed outward as in *Circus*, or short as in *Accipiter*; furthermore, the proximal end of the tendinal groove is more nearly medial in position. Specimen placed with *Buteo lineatus*, based on the following characters: (1) ratio of distance between internal condyle and edge of shaft on posterior side, to breadth of distal end, less than in *swainsoni* or *abbreviatus*; (2) anterior ridge of groove for peroneus profundus more extended than in *abbreviatus* and longer than in *swainsoni*.

MEASUREMENTS OF CENTRUM OF FIRST SYNSACRAL THORACIC VERTEBRA

	^a Breadth	^b Height	^c Ratio of b to a
<i>regalis</i>			
MVZ No.	mm.	mm.	per cent
41409	7.7	5.8	75.3
41189	7.4	6.1	82.4
27570	6.6	5.3	80.3
<i>borealis</i>			
MVZ No.			
49601	7.0	4.9	70.0
41249	6.6	4.4	66.6
41250	6.4	4.7	73.4
<i>lagopus</i>			
MVZ No.			
39698	6.2	4.8	77.5
40366	6.0	4.5	75.0
40367	5.8	4.3	74.1
<i>swainsoni</i>			
(largest)			
MVZ No.			
41407	5.6	4.3	76.8
Emeryville			
specimens			
9998	6.9	4.7	68.1
3681	6.4a	4.6a	71.8

a, approximate.

MEASUREMENTS OF FEMUR

	Length		Length
<i>regalis</i>		<i>swainsoni</i>	
MVZ No.	mm.	MVZ No.	mm.
41189	95.6	41407	69.9
29002	85.4	41408	65.0
<i>borealis</i>			
MVZ No.			
41230	88.4	Emeryville	
41250	80.2	specimens	
<i>lagopus</i>		2636	84.9
MVZ No.		2637	84.8
40367	79.1		
39698	78.3		

Tarsometatarsus.—One right, proximal half; one right, and one left, distal half: *borealis*. Characterized as follows: (1) posterior side, inner proximal foramen at center of base of inner calcaneal ridge, while in *regalis* it is nearer the middle of the shaft; (2) tubercle for tibialis anticus not so prominent as in *regalis*; (3) posterior view of

MEASUREMENTS OF TIBIOTARSUS

	a	b	c	d
	Breadth of proximal end posterior to rotular crest	Breadth of distal end	Distance between internal condyle and edge of shaft	Ratio of c to b
<i>regalis</i>				
MVZ No.	mm.	mm.	mm.	per cent
41189	15.9	15.9	6.0	37.7
27570	13.3	13.2	5.2	39.3
<i>borealis</i>				
MVZ No.				
41230	14.5	15.5	4.9	31.6
41229	12.7	13.4	3.2	23.9
41250	12.3	12.6	3.7	29.3
<i>lagopus</i>				
MVZ No.				
40366	11.8	11.8	4.2	35.5
<i>swainsoni</i>				
MVZ No.				
41407	11.1	11.3	3.5	30.9
41408		10.9	3.7	33.9
<i>lineatus</i>				
L. H. Miller				
Coll. No.				
580		11.0	3.2	29.0
MVZ No.				
11945		10.9	3.2	29.3
<i>abbreviatus</i>				
L. H. Miller				
Coll. No.				
678		10.5	3.4	32.3
Emeryville specimens				
6248	15.0			
7238	13.0			
2883		12.9 ^a	3.6	27.9
1296		10.3	3.0	29.1

a, approximate.

intertrochlear notches, both notches curving toward trochlea for digit 3, while in *regalis* the internal one is straight and the external only slightly curved.

One left proximal, and one left distal half of small *Buteo*, *lagopus* or *swainsoni*; distinguished from other genera of hawks as follows: (1) proximal end relatively broader than *Circus hudsonius*, and distinguished from *Accipiter cooperii* by lateral position of tubercle of tibialis anticus, which in *Accipiter* is approximately central; (2)

MEASUREMENTS OF TARSOMETATARSUS

	Breadth of proximal end	Breadth of distal end
<i>regalis</i>		
MVZ No.	mm.	mm.
41189	17.7	18.3
27570	14.0	14.3
<i>borealis</i>		
MVZ No.		
41230	15.4	17.1
41250	13.2	13.9
<i>lagopus</i>		
MVZ No.		
40366	11.8	13.2
<i>swainsoni</i>		
MVZ No.		
41407	11.9	12.8
41408	11.6	12.2
<i>lineatus</i>		
MVZ No.		
11945	11.7	13.2
L. H. Miller Coll. No.		
580	11.3	12.2
<i>abbreviatus</i>		
L. H. Miller Coll. No.		
678	11.0	11.9
Emeryville specimens		
9999	15.0	
3176	11.3	
9986		16.4
10648		15.6

MEASUREMENTS OF FEMUR

	a Length	b Length of trochanteric ridge	c Ratio b to a
<i>Circus</i>			
MVZ No.	mm.	mm.	per cent
41251	73.9	15.0	20.3
40414	70.7	14.9	21.0
<i>Accipiter cooperii</i>			
MVZ No.			
41405	67.2	15.5	23.0
<i>Buteo swainsoni</i>			
MVZ No.			
41407	70.0	17.7	25.3
41408	64.9	16.9	26.0
Emeryville specimen	Approximately same as		
2646	41251	15.1	20.4?

distal end, though broken so that measurement with calipers is impossible, can be seen by comparison with museum specimens to be broader than either *Circus* or *Accipiter*; (3) relatively shorter and broader than *Circus*; (4) trochlea for digit 2 longer than other two; not so in *Accipiter*.

Circus hudsonius

Femur.—One right, with distal end lacking. Distinguished from *Accipiter cooperii* and *Buteo swainsoni* by larger size and relatively shorter trochanteric ridge. (See table, page 349.)

Elanus leucurus

Material available.—A coracoid and ulna, apparently representing two individuals, since they were taken from different depths in trenches 1 and 2. These trenches, with a connecting trench, 3, forming an H, are those referred to as the controlled excavations which were made after the leveling of the mound.

Coracoid.—One right, complete. Distinguished from other species of hawks by position of coracoidal fenestra: set well in from edge, and more proximal, being closer to scapular facet. Length, 31.0 mm.

Ulna.—One left, distal half. Distinguished from other species of hawks by character of carpal tuberosity: longer and projecting gradually distalward from shaft, not jutting abruptly laterad, as in other species.

Family FALCONIDAE

Material available.—Coracoid, humerus, ulna, femur, and tarso-metatarsus representing *Falco mexicanus*, *peregrinus*, and *columbarius*.

Coracoid.—One right, with proximal head missing. Size places specimen with either *mexicanus* or *peregrinus*, and since the distinction between these two species lies in relative depth of head and the head is missing in this specimen, species identification is impossible. Length of Emeryville specimen, from posterior border to scapular facet, 32.1 mm.; depth of head relative to this length in *mexicanus* 12 per cent to 13 per cent, in *peregrinus* 16 per cent to 17 per cent.

Humerus.—One right, complete. *Falco columbarius*, based on size. Length: *mexicanus*, MVZ no. 41483, 69.7 mm.; *columbarius*, MVZ no. 15631, 51.0 mm.; *sparverius*, MVZ no. 15548, 42.8 mm.; Emeryville specimen no. 9913, 50.3 mm.

Ulna.—One right, distal half. Larger than largest available specimen of *mexicanus*; equals *Polyborus* in size, but distinguished from that genus by relatively longer external condyle. There are no specimens of ulna of *peregrinus* available for comparison. It is possible that the Emeryville specimen may be identified as *peregrinus*.

Femur.—One left, complete. *Peregrinus*, based upon the following characters: (1) head straight on under side, facet not overhanging as in *mexicanus*; (2) proximal end relatively broader; (3) internal condyle relatively deeper.

MEASUREMENTS OF ULNA

	Breadth of trochlea*	Length of external condyle
<i>Polyborus tharus</i> L. H. Miller Coll. No. 206	mm. 9.1	mm. 10.0
<i>Polyborus cheriway</i> L. H. Miller Coll. No. 736	8.2	9.1
<i>Falco mexicanus</i> L. H. Miller Coll. No. 315	7.5	9.2
Emeryville specimen 9989	8.3	10.4

* Measurement taken with palmar side flat against bar of calipers.

MEASUREMENTS OF FEMUR

	a Length	b Breadth proximal end	c Breadth distal end	d Depth of internal condyle	e Ratio of b to a	f Ratio of d to a	g Ratio of d to c
<i>peregrinus</i> MVZ No.	mm.	mm.	mm.	mm.	per cent	per cent	per cent
44216	75.5	14.3	15.3	11.9	19.0	15.7	77.8
45019	67.6	12.7	13.3	10.3	18.7	15.2	77.5
<i>mexicanus</i> MVZ No.							
41228	72.7	13.1	14.1	10.6	18.0	14.6	75.2
40365	71.2	12.9	13.5	10.3	18.0	14.4	76.3
40417	69.8	12.7	13.7	10.4	18.2	14.9	75.9
40869	63.5	11.0	11.6	8.9	17.4	14.0	76.7
41483	62.1	11.0	12.0	9.0	17.9	14.4	75.0
Emeryville specimen 2633	72.9	14.1	14.8	11.4	19.3	15.6	77.1

Tarsometatarsus.—One left, complete: *peregrinus*. One right, distal end: *mexicanus*. Distinguished on the basis of characters described by L. H. Miller (1927, pp. 150-151).

GALLIFORMES

Family PERDICIDAE

Material available.—Sternum, ulna, and femur of *Lophortyx californica*, distinguished from other gallinaceous birds on the basis of small size.

Sternum.—One fragment of anterior portion. Approximate breadth of anterodorsal border between two small projections, 8.8 mm.

Ulna.—Two left, complete. Length, 29.7 mm. and 29.8 mm.

Femur.—One left, complete; one left, without distal end. No. 6779, length 42.1 mm., breadth of proximal end 7.0 mm.; no. 8621, breadth of proximal end 7.4 mm.

GRUIFORMES

Family GRUIDAE

Material available.—*Grus canadensis*: mandible, one fragment of right ramus; coracoid, one left dorsal end; scapula, three right anterior half, one left anterior half (possibly *G. mexicana*); humerus, one left proximal end, three left distal end; ulna, one left shaft with portion of distal end; carpometacarpus, one left proximal half; femur, one right complete, one right distal end. *Grus mexicana*: coracoid, three right (two with furcular facet broken); humerus, one left internal side of proximal end; carpometacarpus, one left proximal half, two right without proximal or distal ends.

According to Grinnell and Wythe (1927, p. 62) there is no good evidence of the existence of *G. mexicana* in this region, though it is supposed that it may have occurred.

The only apparent distinctions between *Grus mexicana* and *G. canadensis* lie in size and in breeding range, the larger, *mexicana*, breeding south of about latitude 52°, the smaller, *canadensis*, being Arctic in summer occurrence. Both migrate southward in winter. As skeletal remains cannot indicate the place of breeding of the represented species, there is only size to fall back upon in the identification of these cranes.

Miller (1925a, p. 318) discussed the probability of there being but one species of *Grus* (*G. canadensis*, by right of name priority). In support of his argument, he uses measurements, of wing and tarsus,

made by Grinnell on over one hundred specimens of cranes. Plotting these measurements in the form of graphs, the result, to cite Miller (*loc. cit.*), is as follows:

Plotted by itself, each species exhibits a slightly bimodal curve that is quite independent of sex. When the entire series is plotted as a single graph regardless of species, a major peak emerges, flanked by minor peaks of approximate equality. The combined graph is of less irregularity than that of the larger species alone. From a study of these several graphs it appears that the surviving species, *G. canadensis* and *G. mexicanus*, cannot be separated on the basis of size of one segment. The paleontologist is therefore inclined to believe, as some ornithologists contend, that only one species with a wide range of size variation persists today.

On looking over the graphs of the combined measurements of the two species, the present writer was impressed by their distinct bimodality, and by the fact that the majority of the individuals of the large species (assuming that the species determinations are correct) fall to one side, the majority of the small to the other, with, to be sure, a certain amount of overlapping. In order to interpret the significance of this observation, the two species were separated, and the means obtained for each group, as well as the probable error of that mean. The difference in the means was then determined, which for length of wing was 36.4 mm.; and for length of tarsus 42.4 mm. Dividing these differences by their probable errors, showed that in length of wing the difference between the means of the two species is 32 times its probable error; and in length of tarsus 59 times. Two groups, the difference in whose means is five times its probable error, are distinct, and the greater this difference, the more certain one may be of the distinction. On this basis, then, there are clearly two groups of cranes represented in the graphs in question. Whether these groups shall be accorded specific value, rather than subspecific, is a question to be decided by a more thoroughgoing study of these birds for the purpose of ascertaining whether or not size is the only anatomical difference between them.

For the purpose of this paper it will suffice merely to recognize that the size difference is sufficiently marked to be of practical value in identifying the cranes in the Emeryville shellmound. For the sake of convenience, the species names *G. mexicana* and *G. canadensis* are employed.

With regard to the specimens of large *Grus* found in the mound, it is unfortunate that no measurements could be made of length of wing or of tarsus. Of the three elements represented in the mound,

MEASUREMENTS OF CORACOID*

	Greatest length, a-b	Distance from glenoid facet to head, c-d	Breadth from glenoid facet to procoracoid, e-f	Depth posterior to furcular facet, g-h
<i>mexicana</i>				
MVZ No. 44496	mm. 84.6	mm. 33.3	mm. 22.5	mm. 18.4
Rancho La Brea specimen U. C. Coll.	84.3	35.0		18.0
<i>mexicana</i>				
MVZ No. 44345	84.2			
Emeryville specimen 8572		33.6		17.8
<i>mexicana</i>				
MVZ No. 44497	83.7	33.2	22.0	18.2
<i>mexicana</i>				
MVZ No. 29547	82.0	33.3	21.6	18.0
Emeryville specimen 16060	81.0	33.4	20.4	17.2
McKittrick specimen U. C. Coll.		32.9	21.5	17.1
McKittrick specimen U. C. Coll.		32.6		18.3
<i>mexicana</i>				
MVZ No. 44498	79.5	31.6	21.5	17.1
Emeryville specimen 16967				17.0
†				
McKittrick specimen U. C. Coll.		30.4	17.3	16.0
McKittrick specimen U. C. Coll.		29.8		15.1
Emeryville specimen 7417		29.7		14.9
<i>canadensis</i>				
MVZ No. 22451	71.4	28.8	17.9	15.4
McKittrick specimen U. C. Coll.		28.4		14.3
<i>canadensis</i>				
MVZ No. 22452	66.3	27.2	18.6	13.6

* See drawing (fig. 55) for position of measurements.

† Line indicates probable limit of *G. mexicana*.

the coracoid is the only one on which satisfactory measurements could be taken. Four measurements were made on specimen no. 16060, two of these on no. 8572, and only one on no. 16967. For comparison, there were available in the Museum of Vertebrate Zoology five specimens of modern *mexicana* and two of *canadensis*. To these were added coracoids from the Rancho La Brea and McKittrick Pleistocene asphalt deposits; the total for two measurements being nine specimens, and for each of the other two, fifteen and sixteen specimens, respectively.

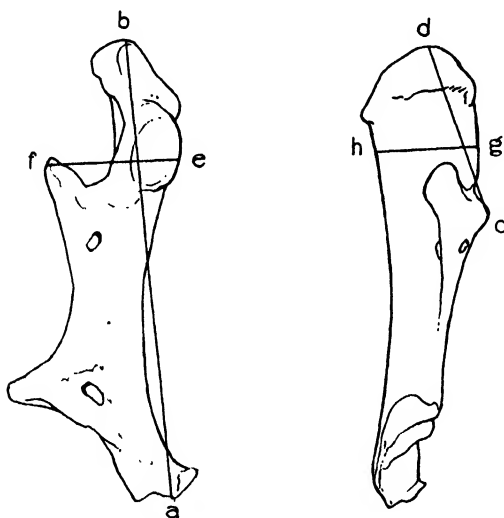


Fig. 55. Drawing of coracoid of crane (*Grus canadensis*) showing positions of measurements given in table.

A positive correlation occurs between the four measurements. In the measurement of length of coracoid, there is a definite break between the large and the small bones, all but one of the former (the second largest in size, which is from La Brea) are modern and thus of known species. The range in size is from 84.6 mm. to 79.5 mm. for the large, Emeryville specimen no. 16060 measuring 81.0 mm. The maximum for the small bones is 71.4 mm., which, it will be noted, is less than the minimum for the large. No measurement of length could be made on no. 8572, but in the two available measurements it falls above specimen no. 16060, and thus within the large group; no. 16967 with its single measurement, lies just within the *mexicana* group. A smaller coracoid, no. 7417, falls within the range in size of *canadensis*.

With so few specimens, it is dangerous to make a definite identification of the Emeryville coracoids. However, the difference in the

Emeryville specimens and the means of the large cranes is very slight, -2.95 mm. in length; this difference if obtained from comparison with fifty specimens would indicate identity; whereas the difference from the mean of the small is $+12.15$ mm., which under favorable conditions would distinctly indicate dissimilarity. The writer thus feels safe in saying that both *mexicana* and *canadensis* are represented in the mound. These specimens of *mexicana* form the only record of Sandhill Crane in the San Francisco Bay district.

Family RALLIDAE

Material available.—Sternum, coracoid, scapula, humerus, carpo-metacarpus, ulna, femur, tarsometatarsus, representing *Rallus obsoletus* and *Fulica americana*.

MEASUREMENTS OF CORACOID

	a Length	b Breadth*	c Distance from scapular facet to head	d Ratio of c to a
<i>Fulica americana</i>				
MVZ No.	mm.	mm.	mm.	per cent.
27608	31.5	8.7	9.2	29.2
<i>Rallus obsoletus</i>				
MVZ No.				
24782	30.7	7.1	7.8	25.4
<i>Gallinula chloropus</i>				
MVZ No.				
44217	27.6	7.2	7.3	26.4
Emeryville specimen				
2212	31.7	8.3	9.0	28.4

* Measurement taken from glenoid facet to procoracoid.

There are three species in the family Rallidae whose elements may be confused on the basis of size, though in entire skeleton the birds range in size from smallest to largest as follows: *Gallinula chloropus*, *Rallus obsoletus*, and *Fulica americana*. The following discussion will be concerned with a comparison of these three species.

Sternum.—One anterior portion: *Rallus obsoletus*. Distinguished from the other species by the marked hollowing out of the dorsal portion of the anterior carinal margin.

Coracoid.—One right, complete: *Fulica americana*. Larger than *Rallus obsoletus* and distinguished from both *obsoletus* and *Gallinula chloropus* by relatively greater distance from scapular facet to head. Further distinguished from *chloropus* by broader posterior end; exact measurement of this breadth cannot be made on the Emeryville specimen, due to a broken edge, but the size can be estimated by comparison with other specimens.

Scapula.—One left complete: *americana*. Distinguished from *obsoletus* and *chloropus* on the basis of size and proportions as indicated in the following table.

MEASUREMENTS OF SCAPULA

	a Greatest breadth of anterior end	b Dorso- ventral depth of acromion	c Breadth of acromion	d Ratio of b to a	e Ratio of c to b
<i>Fulica americana</i>					
MVZ No.	mm.	mm.	mm.	per cent	per cent
27609	9.2	4.0	2.7	43.4	67.5
<i>Rallus obsoletus</i>					
MVZ No.					
24782	7.6	4.7	1.9	61.8	40.4
<i>Gallinula chloropus</i>					
MVZ No.					
44217	7.5	3.2	1.9	42.6	59.3
Emeryville specimen					
6268	9.2	4.1	2.9	44.5	70.7

MEASUREMENTS OF HUMERUS

	a Breadth of proximal end	b Length of bicipital crest	c Ratio of b to a
<i>Fulica americana</i>			
MVZ No.	mm.	mm.	per cent
27609	12.8	12.5	97.6
<i>Rallus obsoletus</i>			
MVZ No.			
24782	12.3	9.3	74.8
<i>Gallinula chloropus</i>			
MVZ No.			
44217	11.2	8.9	79.4
Emeryville specimens			
6368	11.9	11.7	98.2
10130	11.0	8.2	74.5

Humerus.—Two left, proximal half: one of *americana* and one of *obsoletus*. Identification based upon the following characters of the bicipital crest: Proportionately longer in *americana* than in either of the other two species; *obsoletus* shortest of all and with strongly indented and angular margin.

Ulna.—One right, complete; greatest length, 66.0 mm.

Carpometacarpus.—One left, complete; greatest length, 38.2 mm. These bones resemble *americana* in all respects, but since there are no specimens of *obsoletus* or of *chloropus* with which to compare them, the identification is necessarily tentative.

Femur.—One right, with distal end missing: *obsoletus*. Distinguished from *americana* and *chloropus* by prominent, crest-like obturator ridge.

Tarsometatarsus.—One left, with distal end missing: *obsoletus*?; two right, distal end: *americana*. The distinguishing characters of the former are as follows: (1) intercotylar prominence more anterior in position, and tending to overhang the anterior face of the bone as in *obsoletus*; more centrally located in *americana*; (2) external side straight from border of external cotyla down shaft, as in *obsoletus*; markedly indented below the cotyla in *americana*. There are no specimens of this element of *chloropus* available for comparison, and as the distinctions between *Gallinula galeata* and *obsoletus* are not well defined, a comparison with the genus *Gallinula* has been omitted and the Emeryville specimen placed among the tentative identifications. The distinguishing characters of the two specimens of distal end are as follows: (1) Trochleae prominent as in *americana*; (2) breadth across trochleae for digits 3 and 4 greater than in *obsoletus*: *americana*, MVZ nos. 27608 and 27609, 7.1 mm. and 6.7 mm., respectively; *obsoletus*, L. H. Miller coll. no. 546, 6.1 mm.; Emeryville specimens nos. 16352 and 5374, 7.1 mm. and 6.7 mm., respectively; (3) ridge joining trochlea for digit 2 to shaft, with straight or convex, markedly rugose margin; *obsoletus* concave and smoother. The characters of *Gallinula galeata* are sufficiently distinct from *americana* to warrant its use as a representative of the genus *Gallinula*, in the absence of *chloropus*. The trochleae in *galeata* are less prominent than in *americana*, and the shaft, above the trochleae, is straighter.

CHARADRIIFORMES

Material available.—Three hundred eighty-one specimens, including all of the chief skeletal elements. The families represented are Charadriidae, Scolopacidae, Recurvirostridae, Phalaropodidae, Laridae, and Alcidae.

Specific identification has not been attempted for the family Laridae, and such identification as has been ventured for the first four families is necessarily tentative, since a complete series of comparative specimens is not available. For this reason, also, a detailed discussion of all the bones is omitted, and only one or two elements, in which the characters of the species are most marked, are described.

Family CHARADRIIDAE

Material available.—Humerus, carpometacarpus, and tibiotarsus of *Squatarola squatarola* and *Arenaria* sp.

Squatarola squatarola

Humerus.—One right, complete. Greatest length: *Himantopus mexicanus*, MVZ no. 22440, 56.0 mm.; *Squatarola squatarola*, MVZ no. 24579, 55.3 mm.; *Totanus melanoleucus*, MVZ no. 24596, 51.0 mm.; Emeryville specimen no. 16320, 54.4 mm. Distance from external condyle to tip of ectepicondylar prominence greater than in *Himantopus*; this prominence forming an acute angle with the shaft, not a right angle as in *Totanus*.

Tibiotarsus.—One right, distal end. Identification based on depth of external and internal condyles relative to breadth of distal end. See Emeryville specimen no. 953 in table of measurements of tibiotarsus.

***Arenaria* sp.**

Carpometacarpus.—One left. Length of Emeryville specimen no. 3178, 26.3 mm. This is longer than any comparative specimen of *Arenaria* available. Identification based on flattened shaft of metacarpal II.

Family SCOLOPACIDAE

Material available.—Rostrum, sternum, coracoid, humerus, ulna, carpometacarpus, tibiotarsus, and tarsometatarsus. Species identified: *Numenius americanus*, *Phaeopus hudsonicus*, *Catoptrophorus semipalmatus*, *Pelidna alpina*, *Limnodromus griseus*, and *Limosa fedoa*.

Numenius americanus

This species is represented by all of the above named elements. It is distinguished from all other species of this family by larger size.

Phaeopus hudsonicus

Carpometacarpus.—One left, complete. Distinguished on the basis of size; larger than any other species except *Numenius americanus*: length, 44.9 mm., Emeryville specimen no. 10163.

Tibiotarsus.—One left, distal end. See table of measurements of tibiotarsus, Emeryville specimen no. 9973.

Catoptrophorus semipalmatus

Humerus.—One right, one left, proximal end. Identification based on narrow, deep fossa below head, and on size; *Totanus* has a deep fossa, but the bone is smaller. Breadth of proximal end: Emeryville specimens no. 9942, 13.4 mm., and no. 16458, 13.9 mm.

Carpometacarpus.—One left, complete. Greatest length, Emeryville specimen no. 3120, 39.1 mm. Species nearest in size, *Recurvirostra*

MEASUREMENTS OF TIBIOTARSUS

	Distal breadth	Depth of external condyle	Depth of internal condyle
<i>Numenius americanus</i>			
MVZ No.	mm. .	mm.	mm.
30318	9.0	8.1	9.1
<i>Phaeopus hudsonicus</i>			
MVZ No.			
22449	7.8	6.4	7.7
24582	7.2	6.0	7.3
<i>Limosa fedoa</i>			
L. H. Miller			
Coll. No.			
. 485	7.1	6.6	7.4
<i>Catoptrophorus semipalmatus</i>			
L. H. Miller			
Coll. No.			
820	6.5	6.3	7.0
<i>Recurvirostra americana</i>			
MVZ No.			
22448	6.4	7.6	8.2
<i>Squatarola squatarola</i>			
MVZ No.			
22444	5.5	5.1	6.1
Emeryville specimens			
9973	7.8	6.8	7.7a
960	7.3	6.6	7.7
2920	6.6	7.8	8.5
953	5.4	5.1	6.0

a, approximate.

americana of family Recurvirostridae; Emeryville specimen distinguished from *Recurvirostra* and like *Catoptrophorus* in having longer and more slender process of metacarpal I and longer distal symphysis.

Pelidna alpina

Tarsometatarsus.—One left, complete. Length of Emeryville specimen no. 3234, 28.0 mm. Inner of the four ridges of hypotarsus largest, others of about equal size; canals between 1 and 2, and 3 and 4 (innermost ridge numbered 1). In *Calidris alba*, canal between 2 and 3 only; also bone shorter and stockier. *Pisobia maculata* larger.

Limnodromus griseus

Carpometacarpus.—Two right, one left. Nearest in size, *Oxyechus vociferus* and *Pluvialis dominica* of the family Charadriidae. Distinguished from these species by (1) narrower, more pointed process of metacarpal I, and (2) longer distal metacarpal symphysis. Greatest length, Emeryville specimens: no. 3152, 27.9 mm.; no. 3161, 27.3 mm.; no. 1457, 27.0 mm.

Tarsometatarsus.—Two left, complete. Only other species of similar size, *Oxyechus vociferus*. Distinguished from that species by character of hypotarsus: three calcaneal ridges, with outer one bifid; inner one slightly largest, but length about equal to other two; *Oxyechus* with four calcaneal ridges (fourth very small); inner one much the largest and longest, second one small, third about equal in size to that of *Limnodromus*. Greatest length: Emeryville specimen no. 3247, 37.2 mm., and no. —?, 39.1 mm.

Limosa fedoa

Humerus.—Four, distal end (one right, three left). Ectepicondylar prominence arising gradually from ectepicondyle, and coming to a point, directed proximally at its tip; not a distinct, rounded process as in *Phaeopus hudsonicus*; not rounded and blunt as in *Recurvirostra americana* (of the family Recurvirostridae).

Tibiotarsus.—One right, one left, distal end. Identification based on depth of external and internal condyles relative to breadth of distal end. See Emeryville specimen no. 960 in table of measurements of tibiotarsus.

Family RECURVIROSTRIDAE***Recurvirostra americana***

Tibiotarsus.—One right, distal end. Identification based on depth of external and internal condyles relative to breadth of distal end. See Emeryville specimen no. 2920 in table of measurements of tibiotarsus.

Family PHALAROPODIDAE***Phalaropus fulicarius*?**

Ulna.—One left, complete. Neither of the other species of this family is available for comparison. The bone is here compared with *Charadrius semipalmatus* of the Charadriidae, and *Pelidna alpina* and *Calidris alba* of the Scolopacidae. Deeper groove between olecranon and external cotyla than in *Pelidna alpina* or *Charadrius semipalmatus*; bone longer, also. Carpal tuberosity more pointed (less rounded) than in *alpina*, more protruding than in *semipalmatus*; olecranon more prominent than in the latter. Distinguished from *Calidris alba* by size, and by external condyle of distal trochlea connecting more abruptly with shaft as seen in side view. Greatest length: *fulicarius*, MVZ no.?, 34.3 mm.; *alba*, MVZ no. 49504, 33.6 mm.; *semipalmatus*, MVZ no. 43235, 33.0 mm.; *alpina*, MVZ no. 22454, 32.4 mm.; Emeryville specimen 3322, 35.5 mm.

Family LARIDAE

Material available.—Nineteen specimens including the following elements: coracoid, humerus, ulna, carpometacarpus, femur, and tibiotarsus.

Specific identification has not been made, in view of the great overlapping of species characters.

Family ALCIDAE

Material available.—All of the main elements of the skeleton of *Uria troille*; ulna of *Cepphus columba*, and of *Ptychoramphus aleuticus*.

Uria troille

This species is distinguishable from others of the family on the basis of larger size.

Cepphus columba

Ulna.—One right, with proximal end missing. Emeryville specimen no. 3288, greatest breadth of distal end 6.4 mm.; depth 6.4 mm. *Fratercula corniculata*, *Cerorhinca monocerata*, and *Lunda cirrhata* of about same general size but with distal end decidedly narrower than deep. Greater breadth of *Cepphus* due to more produced carpal tuberosity.

Ptychoramphus aleuticus

Ulna.—One right, complete. Emeryville specimen no. 3309, greatest length 38.4 mm., breadth of proximal end 4.8 mm., breadth of distal end 3.8 mm., depth of distal end 4.4 mm., depth of proximal end 5.6 mm. Distinguished from *Synthliboramphus antiquus* and *Brachyramphus marmoratus* in being more slender and with proportionately smaller proximal and distal ends.

STRIGIFORMES

Family TYTONIDAE

Material available.—Coracoid, humerus, ulna, carpometacarpus, pelvis, tibiotarsus, and tarsometatarsus of *Tyto alba*. The following description will be concerned with a comparison of *Tyto alba* with *Strix* and *Asio*, the two genera of the family Strigidae which most nearly approach *Tyto* in size.

Coracoid.—One right, one left, partially broken. Distinguished from *Strix* and *Asio* as follows: (1) furcular facet broadly rounded on ventral edge, narrowing dorsally; the opposite is true of the other species; (2) coracoidal fenestra farther removed from edge of

procoracoid; (3) procoracoid rounded, in the other two genera straightened and forming an angle with shaft. Length from procoracoid to posterior border, Emeryville specimens no. 16445, 21.9 mm., and no. 9924, 21.6 mm.

Humerus.—Two right, one left, proximal end; one right, two left, distal half. Distinguished from *Strix* and *Asio* as follows: (1) proximal end, bicipital crest rounding into shaft, not squared off abruptly; (2) ligamental furrow deep and with distinct walls; (3) bicipital furrow deeper, with steep external boundary; (4) distal end, impression of brachialis anticus markedly depressed, particularly distally; (5) external condyle narrow and pointed.

MEASUREMENTS OF HUMERUS

Emeryville specimens	Breadth of proximal end	Breadth of distal end
	mm.	mm.
7039	16.4	
16344	16.3	
6919	16.0a	
6933		15.3
6903		15.3
6901		14.7

a, approximate.

Ulna.—One right, distal half. Distinguished from *Strix* and *Asio* by the position of the carpal tuberosity, which in *Asio* arises gradually, forming a large obtuse angle with the shaft; in *Tyto* juts out more abruptly, forming an angle only slightly greater than a right angle; and in *Strix* is most prominent, and forms a right angle with the shaft.

Carpometacarpus.—One left, with metacarpal III and part of distal end missing. Differing from *Strix* and *Asio* in that the intermetacarpal tuberosity is a distinct prominence, not connected with metacarpal III. Length, Emeryville specimen no. 3159, 49.7 mm.

Pelvis.—One, nearly complete. Distinguished from *Strix* and *Asio* as follows: (1) antitrochanter slightly over one millimeter below posterior iliac crest, two to three millimeters in the other two genera; (2) articular portion of centrum of first synsacral thoracic vertebra with distinct ventral border, not deeply curved upward and backward against centrum as in the others.

Femur.—One left, distal end; one right, with distal end missing. Proximal end distinguished from (1) *Asio*, by anterior intermuscular line extending to iliac facet and not intersecting trochanteric ridge; and (2) *Strix*, by less prominent obturator ridge and by position of posterior intermuscular lines composing linea aspera: these converge in the center of the shaft in *Tyto* and the outer one (for the extensor femoris) continues proximally to the level of the distal limit of the trochanteric ridge; in *Strix* the lines are parallel and the outer one does not have so great a proximal extension. Distal end distinguished from both *Strix* and *Asio* by (1) internal condyle not clearly marked

off from the ligamental ridges in the intercondylar fossa; and (2) popliteal area markedly excavated under the posterior border of the internal condyle. Measurements: Emeryville specimen no. 16454, breadth of proximal end 10.7 mm.; and no. 16118, breadth of distal end 11.2 mm.

MEASUREMENTS OF TIBIOTARSUS

	^a Greatest breadth of distal end	^b Breadth across condyles posteriorly	^c Depth of internal condyle	^d Depth of external condyle	^e Ratio of b to a
<i>Strix</i>					
MVZ No.	mm.	mm.	mm.	mm.	per cent
45182	11.4	9.2	10.7	10.5	80.6
<i>Tyto</i>					
MVZ No.					
24511	10.9	7.7	10.2	10.5	70.6
23243	9.9	6.8	10.7	10.5	68.7
<i>Asio</i>					
MVZ No.					
41353	9.4	7.5	7.4	7.5	79.8
Emeryville specimens					
5788	10.8	7.3	10.5	10.4 ^a	67.5
5363	10.5	7.4	9.6	9.7	70.4

^a, approximate.

MEASUREMENTS OF TARSOMETATARSUS

	Length	Breadth of distal end
<i>Strix</i>		
MVZ No.	mm.	mm.
45182	58.0	13.7
<i>Tyto</i>		
MVZ No.		
19115	74.0	12.0
<i>Asio</i>		
MVZ No.		
41353	46.1	19.4
Emeryville specimens		
8258	73.1	12.1
10113	71.0	11.5
6918		12.6

Tibiotarsus.—One right, one left, distal half. Too large for *Asio* and condyles relatively deeper; depression above condyles on posterior surface smaller than in *Strix*, both in extent and in depth; condyles closer together posteriorly than in either genus.

Tarsometatarsus.—Two complete; one right, one left, distal end. Longer and more slender than either *Asio* or *Strix*.

Family STRIGIDAE

Material available.—Coracoid, scapula, humerus, femur, tibio-tarsus, and tarsometatarsus, representing *Bubo virginianus* and *Asio*.

Bubo virginianus

In the following descriptions *Bubo virginianus* is compared with the other two genera of large owls, *Nyctea nyctea* and *Scotiaptex nebulosa*, with which there is some possibility of confusion.

Coracoid.—One left, complete. Smaller than *Nyctea* and further distinguished from that genus by scapular facet slightly projecting and region posterior to it rounded; in *Nyctea* the facet does not project and the adjacent region forms an angle bearing a small ridge. *Bubo* more nearly resembles *Scotiaptex nebulosa* in size and in the character just described, but differs from it in being relatively longer from scapular facet to head.

MEASUREMENTS OF CORACOID

	a Length	b Distance from scapular facet to head	c Ratio of b to a
<i>Nyctea</i>			
MVZ No. 27606	mm. 60.3	mm. 23.4	per cent 37.2
<i>Bubo</i>			
MVZ No. 17040	52.0	19.9	38.2
<i>Scotiaptex nebulosa</i>			
MVZ No. 25535	48.6	12.3	25.3
Emeryville specimen			
7898	52.0	19.8	38.1

Scapula.—One left, complete. Smaller than *Nyctea*, and further distinguished therefrom by (1) presence of a depression on dorsal side of acromion, and (2) absence of depression on ventral side of acromion and posteriorly along the line of the teres minor. *Bubo* and *Scotiaptex* are so nearly alike that considering the individual variation which exists, a diagnostic description would be inadvisable with the few comparative specimens available. That the Emeryville specimen is to be classed with *Bubo* rather than *Scotiaptex* seems probable since all of the other elements of large owl are undoubtedly of that species.

Humerus.—One right, external portion of distal end. Distinguished from *Nyctea* by size, and from this genus as well as *Scotiaptex* by shape of ectepicondylar prominence which in *Bubo* is papilla-like and distinct from the ectepicondyle and from the shaft of the bone;

in *Nyctea* it is distinct, but is a longer prominence for its breadth; in *Scotiapterx* it is only distinct from the shaft and runs into the ectepicondyle distally.

Femur.—Two left (one proximal half and one with proximal end missing). Distinguished (1) from *Nyctea* by smaller size; (2) from both *Scotiapterx* and *Nyctea* by more acutely angled obturator ridge at proximal end, and (3) shape of internal condyle, which is directed transversely on the posterior side, ending narrowly, but in *Scotiapterx* and *Nyctea* rounding gradually toward the center of the bone and ending broadly; (4) from *Scotiapterx*, by anterior intermuscular line extending to iliac facet, not intersecting the trochanteric ridge as in the latter genus, and (5) marked depression abutting obturator ridge on internal side, not present in *Scotiapterx*.

Tibiotarsus.—One right, distal end. Distinguished from *Scotiapterx* and *Nyctea*: (1) popliteal area deeply depressed, with depression extending obliquely to proximal end of internal condyle, but with no such excavation above external condyle; in *Scotiapterx*, area deep but uniformly depressed above condyles; in *Nyctea*, depression shallow; (2) a papilla for muscle attachment on the anterointernal margin is relatively higher in position, from the distal end, than in either of the other genera.

MEASUREMENTS OF TIBIOTARSUS

	a	b	c
	Breadth of distal end	Distance from prox. border of internal condyle to prox. border of papilla	Ratio of b to a
<i>Nyctea</i>			
MVZ No. 27606	mm. 17.9	mm. 13.3	per cent 74.3
<i>Bubo</i>			
MVZ No. 17040	16.5	15.8	95.8
<i>Scotiapterx nebulosa</i>			
MVZ No. 25535	14.7	10.4	70.6
Emeryville specimen			
8290	14.4a	14.2	98.6

a, approximate.

Tarsometatarsus.—Three right, four left, partially broken. Relatively more slender than either *Scotiapterx* or *Nyctea*. Further distinguished from those genera by (1) character of tubercle for tibialis anticus, a small ridge in *Bubo*, a longer and higher ridge in *Scotiapterx*, and a low, broad scar in *Nyctea*; (2) distal trochleae smaller than in *Nyctea* and not spread so far apart as in *Scotiapterx*.

MEASUREMENTS OF TARSOMETATARSUS

	a Length	b Breadth of proximal end	c Breadth of distal end	d Breadth of shaft	e Ratio of b to a	f Ratio of c to a
<i>Nyctea</i>						
MVZ No. 27606	mm. 56.0	mm. 17.8	mm. 19.5	mm. 9.8	per cent 31.8	per cent 34.8
<i>Bubo</i>						
(largest) MVZ No. 17040	64.5	16.3	17.9	8.8	25.2	27.7
(smallest) MVZ No. 26175	55.0	12.9	15.5	7.5	23.4	28.2
<i>S. nebulosa</i>						
MVZ No. 25535	55.1	15.0	16.9	8.3	27.2	30.6
Emeryville specimens						
8039	63.6	15.7a	18.0a	9.1	24.7	28.3
1405	63.0	15.2	17.9	8.3	24.1	28.4
3185	63.0	15.3	17.4	7.8	24.3	27.6

a, approximate.

Asio

Humerus.—One left, proximal end. Distinguished from *Tyto alba* as stated above. Distinguished from *Strix occidentalis* (1) in the nature of the pneumatic foramen which is small and not set in a deep pneumatic fossa; (2) bicipital furrow irregularly oval in shape, but in *Strix*, circular.

PASSERIFORMES

Material available.—All of the main elements of the skeleton, representing *Corvus corax* and *C. brachyrhynchos*, of the family Corvidae, the latter species being of considerably greater abundance (sixty-four specimens out of seventy-eight). One tibiotarsus and one tarso-metatarsus of small, unidentifiable passerine.

Corvus corax, the largest of the passerine birds, is easily distinguished because of this fact. *C. brachyrhynchos*, with bones smaller than *corax*, yet markedly larger than the other passerines, is also distinguishable on the basis of size.

COMPARISON OF THE AVIFAUNA OF EMERYVILLE SHELLMOUND WITH OTHER AVIFAUNAS

In following the discussion, it will be of assistance to consult the accompanying table (p. 369). The birds therein listed are those which would be expected to occur in habitats such as originally existed in the Emeryville region. The actual Emeryville site as it is today is not considered here, for the building of factories around, and now upon, the site, together with the use of the Bay shore in that region as a dumping ground, has destroyed practically all of the original environmental associations. The first column does not refer to the birds of any particular locality, but to those which occur near Oakland and Berkeley today (or have occurred within historic times) in habitats similar to those represented in prehistoric Emeryville. In column two the Emeryville shellmound birds are listed. The following eight columns include the birds of the best known Pleistocene horizons of the west coast.

RECENT

Consulting columns one and two of this table, we note (1) that certain birds are common to the present and Emeryville faunas; (2) that other species are present today which are absent from the earlier fauna; and (3) that one species present in the Emeryville fauna is absent entirely from the Bay records, while three others have been absent or of extremely rare occurrence since the latter part of the nineteenth century. Another difference in the faunas—which is not noted in the table—is the relative abundance of species; certain species abundant today are represented by but a few specimens in the shellmound.

That there should be many species common to the two avifaunas is, of course, to be expected, since there has been no great lapse of time between the two. The discrepancies which do exist, however, are deserving of some attention and of an attempt at explanation.

The absence, in the mound fauna, of species present in a similar environment in the Bay region today, may be accounted for by subsequent invasion of the territory by the species in question, due to removal of barriers to distribution elsewhere in the state. The writer has no evidence for this theory, except in so far as the absence of certain species cannot be explained on other grounds (for example,

TABULAR COMPARISON OF THE AVIFAUNA OF EMERYVILLE SHELL-
MOUND WITH RECENT AND PLEISTOCENE AVIFAUNAS*

	Recent		Pleistocene							
	Bay region today	Emeryville mound	Hawver Cave	Samuel Cave	Potter Creek Cave	Rancho La Brea	McKittrick	Carpinteria	San Pedro	Fossil Lake
	1	2	3	4	5	6	7	8	9	10
<i>Gavia immer</i> (Brünnich).....	×	×							×
<i>Gavia stellata</i> (Pontoppidan).....	×	×							
<i>Gavia pacifica</i> (Lawrence).....	×	?							
<i>Gavia</i> sp.....									×
<i>Colymbus holboellii</i> (Reinhardt).....	×									×
<i>Colymbus auritus</i> Linnaeus.....	×									×
<i>Colymbus nigricollis</i> (Brehm).....	×	×								×
<i>Aechmophorus occidentalis</i> (Lawrence).....	×	×								×
<i>Aechmophorus lucasi</i> Miller.....										×
<i>Podilymbus podiceps</i> (Linnaeus).....	×	?					×			×
<i>Diomedea</i> sp.....	×	×							×
<i>Puffinus</i>	×								×
<i>Fulmarus glacialis</i> (Linnaeus).....	×								×
<i>Pelecanus erythrorhynchos</i> Gmelin.....	×	×								×
<i>Pelecanus occidentalis</i> Linnaeus.....	×	×							
<i>Phalacrocorax auritus</i> (Lesson).....	×	×							
<i>Phalacrocorax penicillatus</i> (Brandt).....	×	×							×
<i>Phalacrocorax pelagicus</i> Pallas.....	×	×							
<i>Phalacrocorax macropus</i> Cope.....										×
<i>Ardea herodias</i> Linnaeus.....	×	×				×	×			×
<i>Ardea paloccidentalis</i> Shufeldt.....										×
<i>Casmerodius egretta</i> (Gmelin).....	×	^a							
<i>Butorides virescens</i> (Linnaeus).....	×								
<i>Nycticorax nycticorax</i> (Linnaeus).....	×								
<i>Botaurus lentiginosus</i> (Montagu).....	×					×				×
<i>Ajaia ajaja</i> (Linnaeus)?.....						×			
<i>Mycteria americana</i> Linnaeus.....	×	^b				×			
<i>Jabiru mycteria</i> (Lichtenstein).....						×	×		
<i>Ciconia maltha</i> Miller.....						×		×	
<i>Plegadis guarauna</i> (Linnaeus).....	×	^b	×			×			
<i>Phoenicopterus copei</i> Shufeldt.....										×
Anseriformes.....	×	×	×	×	×	×	×	×	×	×
<i>Cathartes aura</i> (Linnaeus).....	×	×	×	×	×	×		×	×
<i>Coragyps occidentalis</i> (Miller).....						×		×	
<i>Coragyps shastensis</i> (Miller).....			×	×	×				
<i>Gymnogyps californianus</i> (Shaw).....	×	^a	×			×		×	
<i>Gymnogyps amplius</i> Miller.....				×	×				

* The following references have been used in preparing this table: Grinnell and Wythe (1927), Miller (1911, 1912, 1914, 1925a, 1925b, 1927a, 1927b, 1928), Shufeldt (1913).

^a Present in the Bay region before the late 1800's.

^b Rare.

TABULAR COMPARISON OF THE AVIFAUNA OF EMERYVILLE SHELLMOUND WITH
RECENT AND PLEISTOCENE AVIFAUNAS—(Continued)

	Recent		Pleistocene							
	Bay region today	Emeryville mound	Hawver Cave	Samuel Cave	Potter Creek Cave	Rancho La Brea	McKittrick	Carpinteria	San Pedro	Fossil Lake
<i>Sarcorhamphus clarki</i> Miller.....	1	2	3	4	5	6	7	8	9	10
<i>Cathartornis gracilis</i> Miller.....						X				
<i>Teratornis merriami</i> Miller.....						X	X	X		
<i>Elanus leucurus</i> (Vieillot).....	X ^a	X				X				
<i>Astur atricapillus</i> (Wilson).....	X ^b							X		
<i>Accipiter</i>	X			X		X		X		
<i>Buteo</i>	X	X	X	X	X	X	X	X		
<i>Aquila chrysaetos</i> (Linnaeus)....	X					X	X	X		X
<i>Aquila sodalis</i> Shufeldt.....										X
<i>Aquila pliogyps</i> Shufeldt.....										X
<i>Haliaeetus leucocephalus</i> (Linnaeus) ..	X ^c	X				X				X
<i>Morphnus woodwardi</i> Miller.....						X				
<i>Wetmoregyps daggetti</i> (Miller).....						X		X		
<i>Geranoaetus melanoleucus</i> (Vieillot) ..			X							
<i>Geranoaetus grinnelli</i> Miller.....						X		X		
<i>Geranoaetus fragilis</i> Miller.....						X		X		
<i>Neogyps errans</i> Miller.....						X		X		
<i>Neophrontops americanus</i> Miller ..						X	X	X		
<i>Circus hudsonius</i> (Linnaeus).....	X	X				X	X			X
<i>Falco mexicanus</i> Schlegel.....	X	X				X	X			
<i>Falco peregrinus</i> Tunstall.....	X	X			X	X	X			
<i>Falco swarthi</i> Miller							X			
<i>Falco columbarius</i> Linnaeus	X ^b	X				X				
<i>Falco sparverius</i> Linnaeus.....	X			X	X	X	X	X		
<i>Polyborus</i>						X	X	X		
<i>Lophortyx californica</i> (Shaw).....	X	X	X			X	X	X	X	
<i>Parapavo californicus</i> (Miller)....						X		X		
<i>Meleagris</i> sp.....			X		X					
<i>Grus canadensis</i> (Linnaeus).....	X ^c	X				X	X			
<i>Grus mexicana</i> (Müller).....		X				X	X			
<i>Grus americana</i> (Linnaeus).....						X				
<i>Rallus obsoletus</i> Ridgway.....	X	X								
<i>Rallus virginianus</i> Linnaeus	X						X			
<i>Porzana carolina</i> (Linnaeus).....	X									
<i>Coturnicops noveboracensis</i> (Gmelin)	X ^b									
<i>Gallinula chloropus</i> (Linnaeus).....	X ^b									
<i>Fulica americana</i> Gmelin.....	X	X								X

^a Present in the Bay region before the late 1800's.^b Rare.^c Rare now, but formerly common.

TABULAR COMPARISON OF THE AVIFAUNA OF EMERYVILLE SHELLMOUND WITH
RECENT AND PLEISTOCENE AVIFAUNAS—(Concluded)

	Recent		Pleistocene							
	Bay region today	Emeryville mound	Hawer Cave	Samuel Cave	Potter Creek Cave	Rancho La Brea	McKittrick	Carpinteria	San Pedro	Fossil Lake
	1	2	3	4	5	6	7	8	9	10
<i>Fulica minor</i> Shufeldt.....										X
<i>Charadrius</i>	X									
<i>Oxyechus vociferus</i> (Linnaeus).....	X						X			
<i>Squatarola squatarola</i> (Linnaeus) ..	X	X								
<i>Arenaria</i>	X	X								
<i>Capella delicata</i> (Ord).....	X									
<i>Numenius americanus</i> Bechstein.....	X	X								
<i>Phaeopus hudsonicus</i> (Latham).....	X	X								
<i>Actitis macularia</i> (Linnaeus).....	X									
<i>Catoptrophorus semipalmatus</i> (Gmelin).....	X	X								
<i>Totanus melanoleucus</i> (Gmelin).....	X						X			
<i>Pisobia</i>	X									
<i>Pelidna alpina</i> (Linnaeus).....	X						X			
<i>Limnodromus griseus</i> (Gmelin) ...	X	X					X			
<i>Ereunetes mauri</i> Cabanis.....	X									
<i>Limosa fedoa</i> (Linnaeus).....	X	X								
<i>Calidris alba</i> (Pallas).....	X									
<i>Recurvirostra americana</i> Gmelin.....	X	X					X			
<i>Himantopus mexicanus</i> (Müller).....	X									
<i>Phalaropus fulicarius</i> (Linnaeus).....	X	X								
<i>Lobipes lobatus</i> (Linnaeus).....	X									X
<i>Larus</i>	X	X								X
<i>Uria troille</i> (Linnaeus).....	X	X								
<i>Cephus columba</i> Pallas.....	X	X								
<i>Synthliboramphus antiquus</i> (Gmelin).....	X								X	
<i>Ptychoramphus aleuticus</i> (Pallas) ..	X	X								
<i>Columba fasciata</i> Say.....	X					X		X		
<i>Zenaidura macroura</i> (Linnaeus).....	X					X	X			
<i>Geococcyx californianus</i> (Lesson) ..	X					X	X	X		
<i>Tyto alba</i> (Scopoli).....	X	X				X		X		
<i>Otus asio</i> (Linnaeus) ..	X				X	X				
<i>Bubo virginianus</i> (Gmelin) ..	X	X		X		X	X	X		X
<i>Bubo sinclairi</i> Miller.....				X	X					X
<i>Speotyto cunicularia</i> (Molina) ...	X					X	X			
<i>Asio</i>	X	X		X		X				
<i>Corvus corax</i> Linnaeus	X	X	X			X	X	X		
<i>Corvus brachyrhynchos</i> Brehm	X	X			X	X		X		X

possibly, the Night Heron). A more probable explanation of absence of species, however, is directly related to the mode of accumulation of the shellmound material: the fact that the mound is man-made introduces selective factors. These factors influence not only the presence or absence of species, but their relative abundance as well. Such factors are: (1) value of the bird to the Indians for (a) food, (b) feathers, (c) ceremonials, (d) artifacts; (2) ease of capture, involving (a) methods employed in hunting, and (b) habits of the birds.

The various ways in which birds were used by the "Emeryville Indians" are mere conjecture. Undoubtedly many species, particularly of the water birds, were captured primarily for food; others may have been prized for their feathers, and still others worshipped. Bird bones were also used in making artifacts. All these practices differ in the different groups of Indians. In many tribes certain animals, because of some superstition, are never eaten; the species which are taboo differ in different regions. Similarly the birds selected for their feathers are not the same throughout California. The species which are used in ceremonials also vary, though there apparently is a tendency toward the worship of the falconiform birds. In the San Joaquin Valley, the Miwok ceremonies center particularly around the eagle, condor, and Prairie Falcon (Gifford, 1926, p. 394). Unfortunately, very little is known of the Costanoan Indians, who inhabited the San Francisco Bay region during the early Mission days, but are now extinct. Kroeber (1925, p. 466) believes that at least the upper layers of the Bay mounds may be attributed to these people. Our knowledge of their customs is scant, and in the literature to date there are no references to the use of birds, except that in the mythology of the people the eagle is one of the first three creatures to appear on earth, and is chief. The artifacts of the "Emeryville Indians" are preserved for us in the shellmound. For the making of tubes and whistles (Schenck, 1926, pp. 222-223) any suitable bones were used; we cannot say that any particular species was captured for the express purpose of using the bones for artifacts. In a random sample of artifacts, the writer finds a distal end of the humerus of a pelican cut squarely across showing knife marks; tubes and whistles of the ulna of eagles, hawks, and geese; and an awl of the radius of a Great Blue Heron.

Regarding the methods of hunting employed by these early inhabitants of the Emeryville region, scarcely anything is known. Nothing has been recorded on this subject from the Costanoans. To the north and east we find that the Wintuns (Kroeber, 1925, p. 359), Maidus (*op. cit.*, p. 410), and Yokuts (*op. cit.*, p. 529) used nets for ducks,

attracting them by means of decoys. Geese, pigeons, and crows were also netted by the Maidus. Another method employed by these people for capturing waterfowl was the placing of a series of nooses over the surface of the water. The Yokuts used the noose for capturing pigeons and eagles. From a study of the artifacts from the shellmound itself, Schenck (1926, p. 276) says, "Waterfowl and deer . . . were freely obtained by means of snares, traps and wooden weapons rather than by bows and stone-tipped arrows."

A discussion now follows of the species whose representation in the shellmound does not correspond with the present-day condition of the avifauna.

Gavia pacifica.—Doubtfully represented by a single specimen out of the fifty-four assigned to the family Gaviidae. The Pacific Loon is today more common on the Bay than either the Red-throated or the Common Loon. In the mound the reverse is true. If the loons were used for food, as it seems probable they were, there is no apparent reason why the Pacific Loon should have been taboo while the others were not. The cause of the discrepancy, then, revolves around the ease of capture. Dr. E. R. Hall reports (verbally) encountering many loons at Tomales Bay, in the spring of 1928, and finding the Pacific Loon more wary than the Common or Red-throated. Whether this is always true is a matter requiring further observation.

Colymbus holboellii, *C. auritus* and *Podilymbus podiceps*.—The Holboell Grebe is certainly absent from the shellmound fauna, the Horned and Pied-billed probably so. The Western and Eared grebes are present. So far as food preferences are concerned, there would be no reason for choosing the latter species to the exclusion of the other three. Formerly Western and Eared grebes were hunted in great numbers for their feathers (Bent, 1919, p. 33). It is possible that the Indians, too, preferred these species for the same reason. In speaking of the capture of these birds for their feathers, Bent (*loc. cit.*) remarks that they are tame and easily killed.

Botaurus lentiginosus, *Rallus virginianus*, *Porzana carolina*, and *Coturnicops noveboracensis* are all distinctively fresh-water marsh birds. Their absence may mean either that there was no real tule marsh present in the region, or, if present, its inhabitants were so secretive, that, in view of the numbers of ducks, geese, and shore birds available as food, the Indians did not bother with these less easily obtained marsh birds. That Temescal Creek overflowed its banks near the Bay, producing marshy ground, is remarked upon by both Uhle (1907, p. 3) and Schenck (1926, p. 156). Uhle makes no mention of

the type of vegetation; Schenck (*loc. cit.*) refers only to "a more luxuriant plant growth which must have furnished coverts for game." Apparently then, there is some evidence of the presence of a fresh-water marsh such as would provide the necessary habitats for these birds. Certainly the fresh-water marsh birds are secretive and hard to flush, and in addition the two rails are small and scarcely worth the trouble of capture. In this regard it is noteworthy that the little Black Rail, of similar size and behavior, but an inhabitant of the salt marsh, is also absent.

Casmerodius egretta.—The absence of the American Egret might be accounted for on the basis of its wary habits and consequent difficulty of capture. It would seem, however, that its feathers would have been an added incentive, and that the Indians would have made a particular effort to capture the bird even though it was not necessary for food.

Butorides virescens and *Nycticorax nycticorax*, associated both with marshlands and willows, are absent. The unobtrusiveness of the Green Heron may have played a part in its being overlooked, but the writer can offer no plausible explanation for the absence of the Night Heron, unless we consider the possibility of its having invaded the region since the time of shellmound habitation.

The three bird hawks, *Astur atricapillus*, *Accipiter velox*, and *A. cooperii*, are absent. The Goshawk has been known only as a rare visitant to this region; but as to the absence of the other two species no reason can be advanced beyond the operation of chance.

Falco sparverius.—The absence of the Sparrow Hawk is difficult to explain. It is often seen in the open, even close along the Bay shore, and may be approached within a fairly short distance. Its small size may have been a deterring factor in its capture.

Aquila chrysaetos.—The absence of the Golden Eagle, strictly an inhabitant of the hills and mountains, might indicate the restriction of hunting by the Indians to the bay shore.

Columba fasciata and *Zenaidura macroura* are both absent. The Mourning Dove would be more apt to be found in the interior, however, than coastwise. The Band-tailed Pigeon has been captured by other tribes of Indians within history, so there is reason to believe that the "Emeryville Indians" would have captured them, had they been at hand. These birds are associated with live oaks. We have noted earlier in this paper the presence of a large grove of these trees within two or three miles of the site. The hills, too, offered a suitable habitat.

If the pigeons were restricted to the hills, their absence might better be accounted for, because apparently the Indians did not include the hill country in their bird-hunting range. The Valley Quail is the only chaparral bird represented in the mound, and it, of course, may well have been present along the brushy borders of Temescal Creek down near to the coast.

Geococcyx californianus.—The absence of the California Road-runner is a still further indication of the limitation of the distance traveled by the "Emeryville Indians" for their food.

Otus asio and *Speotyto cunicularia*.—The small size of these two owls may, in part at least, account for their absence. That the Screech Owl should not be present, is not surprising, as it is seldom seen. The Burrowing Owl, however, is active during the day, and may often be observed. As it is an inhabitant of treeless fields or hillsides, its habitat may well have been out of the Indians' hunting range.

With the exception of the Passeriformes, none of the orders of birds beyond the Strigiformes is represented; of the passerines, the small forms are represented by only two bones, though crows and ravens are numerous. The absence of woodpeckers is surprising, since many of the modern Indians use their feathers extensively for ornamentation. That there should be no very small birds may be explained by the fact that with the many larger birds available, it was useless to capture the smaller ones. There is a further possibility that even if small birds were captured, they were eaten "bones and all."

Possible absences in the Anseriformes and Charadriiformes have not been considered, since in the former, specific identification has not been attempted, while the greater part of that which has been undertaken for the Charadriiformes is tentative and incomplete.

That certain species should be present in the mound though absent today, must be due, in part at least, to the changed conditions introduced by civilization. The question is thus one of particular biological significance.

Gymnogyps californianus is represented by the bones of possibly two individuals. The California Condor nests in caves on the faces of rocky cliffs or in crevices behind boulders on steep slopes, while its feeding area extends widely over the mountains and out onto the open country of the great valleys. W. L. Finley (1908, p. 10) quotes Dr. J. K. Townsend as saying that in the region of the Columbia River the condor was "met with near the Indian villages, being attracted by the offal of the fish thrown around their habitations."

In 1903 and 1904 condors were reported from southern Oregon (*loc. cit.*). The latest record for this species in the Bay district was January, 1904, in San Mateo County (Fisher, 1904, p. 50). It has been reported from Sequoia National Park, Tulare County, up to December, 1925 (Fry, 1926). At the present time it does not reach farther north than Monterey and San Benito counties, and is found as far south as Baja California. Its territory is becoming more restricted and it is diminishing in numbers.

To civilized man has fallen the blame for the disappearance of the condor. Indirectly, this is so. To be sure, so large a bird is a tempting target, but this alone would not cause the extermination of a species. There have been reports of condors being killed by the poisoned carcasses used as bait for the carnivorous mammals which preyed upon stock (Fry, 1926). However, Turkey Vultures are known to feed upon the same food as the condor; Fry (1926) cites several instances of the two species found feeding upon the same carcass. Turkey Vultures are not diminishing in numbers. Apparently there is a larger factor making for the extinction of *Gymnogyps*. The California Condor feeds primarily on the carcasses of large mammals, probably such as the deer and elk known to have been plentiful in this region in the early days. With the disappearance of these native mammals from the region, the condor must necessarily have disappeared also, or have moved to a region where such food is available, or where civilization, in destroying the wild mammals, has in a measure replaced them with domestic stock. Such a substitution, however, cannot long be satisfactory, in view of the increasing restriction of the cattle ranges.

Elanus leucurus.—Though there are but two specimens of the White-tailed Kite in the shellmound, these are sufficient to recall to mind that before the latter part of the nineteenth century, kites were common to this region. Now, however, they are rare both here and elsewhere, and appear to be approaching extinction. The clearing of areas of live oak and willow in the valleys, accompanying civilization, has eliminated the kite's habitat. The kite is primarily a valley bird and apparently it cannot adapt to its needs the type of forested area which remains in the hill country.

Haliaeetus leucocephalus, represented in the shellmound by three unassociated specimens, was common in the Bay district before 1870. At the present time it is confined very largely to the islands off the southern coast of California, and is diminishing in numbers. Reports

of the food preferences of the Bald Eagle include fish, water birds, and lambs of the domestic sheep on the islands where it now dwells. Since this bird nests in large trees where available, and feeds for the most part along shore lines, the environment at Emeryville was ideal. Today, however, civilization has entered its realm, the coastal regions of the mainland are well inhabited, and the nesting sites are destroyed. Another factor in the extermination of Bald Eagles is that they are consistently shot by the ranchers whose sheep are endangered by the predatory habits of these birds.

Grus canadensis and *G. mexicana* both have a fair representation in the shellmound. The Little Brown Crane, though probably fairly common at one time as a winter visitant, has not been identified here for many years; the Sandhill Crane has not been recorded in the Bay region before. The cultivation and inhabitation of former grasslands and prairies may well have brought about the restriction of these species to the more open plains of the interior valleys where they are now to be found.

PLEISTOCENE

Turning now to a comparison of columns three to ten with column two of the table, we note that in no case is an extinct Pleistocene species listed among the birds of Emeryville mound. This fact affords further proof of the Recency of the shellmound deposits. It is of significance, also, in that it indicates the presence of a natural factor (not associated with civilized man) causing the extinction of these species, and bids us pause before attributing entirely to man the disappearance of various species whose extinction we are witnessing today.

Of particular interest in this regard is the absence of the vultures, *Coragyps occidentalis*, *Cathartornis gracilis*, and *Sarcorhamphus clarki*, the eagle-vulture, *Teratornis merriami*, and the six species of extinct eagles. Their absence here is, of course, negative evidence; the Golden Eagle, also, is absent, yet it lives today. Not knowing the habits of the extinct forms, we cannot know whether their habitats were such as to bring them within the "Emeryville Indians' " hunting range. However, we find the Turkey Vulture and California Condor, so why not *Coragyps*, *Cathartornis*, *Sarcorhamphus*, and *Teratornis*? The writer believes that the Pleistocene vultures and eagles were already extinct. There is reason to believe that whatever cause brought about their extinction is still functioning, as witnessed in the gradual

disappearance of still other raptorial birds today, the California Condor, Bald Eagle, and White-tailed Kite. This extinction of raptorial birds has taken place along with the extinction of many of the carnivorous mammals, and this in turn is probably correlated with a decrease in the number of herbivorous forms, and in final analysis reverts to changes in the plant environment. Whether there is, in addition to the strictly environmental factor, a senescence of species, similar in nature to the senescence of individuals, which influences the adaptability of the species to a changing environment, is a question which has often been raised. At present there is no proof to offer in this regard.

FACTS OF ANTHROPOLOGICAL INTEREST

A study of the materials used by a people is often the chief means of obtaining knowledge regarding the habits of that people. Anthropologists have investigated to the utmost every source of information regarding the Emeryville shellmound, with the exception of the skeletal remains of vertebrate animals found therein. Until now these remains have been studied only as they have been worked by the Indians as artifacts, or have been hastily identified as a means of obtaining an idea of the animals eaten by the Indians. Several other aspects regarding the habits of the "Emeryville Indians" have been revealed in the present study of bird remains.

BROKEN BONES

Earlier in this paper we noted the fact that the long bones of the larger birds are broken, most of them transversely through the middle, others with the shaft intact, but the ends missing. In examining the artifacts made from bird bones, we find a great number of whistles. These are made of long bones which are broken, or cut off at each end, and a hole cut in the middle of one side. Schenck (1926, pp. 222-223) remarks upon the presence of tubes which he considers to be artifacts in the process of manufacture. Many of the broken bones in the collection here studied may come under the heading of tubes. The whistles of bird bone, examined by the writer, are broken in two in much the same manner as observed in all of the larger long bones of the collection. Schenck (*op. cit.*, pp. 224 and 276) speaks of the "killing" of artifacts—the breaking of the artifact before placing it with the dead. These broken whistles may, then, have been "killed."

Considering the fragility of bird bone, however, may they not have been weakened or fractured in the process of cutting the hole in the shaft? Similarly, may not some of the other bones, not classified as artifacts, have been broken at the first application of the knife? This idea is, of course, merely a suggestion, and could hardly be applied to all of the broken bones. There is still another aspect to be considered. Some of the pieces of bone are charred at the broken end. This may indicate that in some cases the breaking was a part of the preparation of the bird for eating. Mr. Gifford has suggested to the writer that since netting and snaring were apparently the chief means of capturing birds, the wing bones might have been broken at the time of capture, to prevent the escape of the bird before it could be killed.

HUNTING RANGE

The avifauna of the Emeryville mound is such as to indicate a hunting range restricted to the vicinity of the Bay shore. The predominating species are water birds; and the land birds which are present could all have been found close to the Bay. Birds that are distinctive of hill-country, such as the Golden Eagle and the California Road-runner, are absent. The Valley Quail is the only chaparral species represented and it undoubtedly would have been found near the Bay in the brush bordering Temescal Creek.

NESTLING CORMORANTS

A particularly notable feature of the shellmound avian collection is the presence of over two hundred specimens of nestling cormorants. These specimens were taken from various depths and localities in the mound. Both Farallon and Brandt cormorants appear to be represented, though in the immature state the distinguishing characters of the bones of these two species are weakly marked. That these birds had not left the breeding grounds is attested by the fact that practically all the main skeletal elements are present in an immature state; these include pelvis, shoulder girdle, and wing bones, as well as the leg bones, which latter being composed of more than one ossification center, would be expected to lag behind the rest of the skeleton in reaching maturity.

Evidently, then, the "Emeryville Indians," over a long period, were in the habit of robbing cormorant rookeries. In view of the fact that the raft-like tule balsa is the only type of craft known to

have been used by the Indians of this part of the state, it is highly improbable that this rookery was outside the Bay. Within the Bay, Alcatraz, Angel, and Goat islands would all have been possible nesting sites, Angel and Goat islands being, perhaps, most accessible. Though the proximity of these latter islands to the mainland and its predatory animals might have proved a deterring factor in the establishment of a rookery, we cannot say that such was the case, since today cormorants are known to nest even on the mainland. Dr. Loye Miller reports (verbally) the presence of a Brandt Cormorant colony near Scripps Institution, La Jolla, and Willett (1909, p. 186) reports a Baird Cormorant colony on cliffs along the shore near San Luis Obispo. Willett (*loc. cit.*) also reports Brandts nesting on rocky islands such as are accessible from the mainland at low tide.

It has been suggested that there may have been a colony of tree-nesting cormorants in this region. Such a colony would have been possible for the Farallon Cormorant, but the Brandt is known to nest only on rock surfaces. However, wherever tree rookeries of Farallon have been reported, they have been situated inland. Certainly, trees suitable for nesting were present on the Bay shore; but would the birds have chosen such a site with the islands so near at hand? Considering the improbability of this choice, as well as of the fact that a tree-nesting colony would not explain the presence of Brandt young, it seems more logical to believe that the rookery visited by the Indians was located on one of the islands in the Bay, possibly Alcatraz Island, upon which, according to travelers' accounts written before 1850, a colony of sea-birds was nesting (Grinnell, 1924, p. 15).

CONTINUOUS RESIDENCE

Since the San Francisco Bay shellmounds first became known to anthropologists, the question of duration of residence on a particular site has been raised. In calculating the ages of mounds upon the basis of rate of accumulation of material, the results have often been influenced by the possibility of a non-continuous residence of the Indians on the site.

A study of the bird bones included in the Emeryville mound has thrown some light on this question. We have seen that the preponderance of species in the mound is of ducks and geese; these are represented by adult bones only. With but four exceptions, all the ducks to be expected around the Bay are primarily winter visitants,

though a few of them have been known to hold over in small numbers through the summer. The genus *Mergus*, of whose presence in the mound the writer is assured, since its skeletal characters are sufficiently characteristic to permit of identification, has been recorded by present-day observers only from January 1 to April 11. All the geese are strictly winter visitants, the extreme recorded dates of inhabitation running from October 1 (Common White-fronted Goose) to the last week in April (Black Sea Brant). On this evidence, then, we can say with certainty that the shellmound was occupied during the winter months.

Next in abundance to the Anatidae are the Phalacrocoracidae—the cormorants. The cormorants are resident species, but we find that nearly one-half of the 525 specimens of cormorant are of young, nestling birds, probably of Farallon and Brandt.

If we may judge the rate of growth of Farallon and Brandt cormorants by their near relative, the Double-crested, we will expect eight weeks to elapse after hatching before the young are able to fly, though they are able to swim as soon as the body is fully feathered (Bent, 1922, p. 247), or about six weeks after hatching (*op. cit.*, p. 246). The young are naked when hatched but down begins to grow in about ten days, and within three weeks the bodies are covered with thick, short black down; the wings and tail then begin to grow, before the body plumage is fairly started. As soon as the wings and tail are developed the chicks begin wandering away from the nest, though not attempting to swim. At this time they are of almost adult bulk (*op. cit.*, p. 247). From the condition of the immature bones of the Emeryville collection, it appears that it was at this stage in development that the Indians made their raids on the cormorant rookeries. The bones are practically as large as those of the adult bird, but they are in an early stage of ossification, when undoubtedly the birds were unable to do more than unsteadily wobble about on land.

The following accounts are cited as indicative of the time of year when the rookeries were probably visited by the Indians. The egg-laying season extends from the middle of May to the last of July, with that of the Farallon slightly in advance of that of the Brandt.

Ray (1904, p. 436) reports visiting a Farallon cormorant rookery on the Farallon Islands on May 29, 1904, at which time he found nests containing well incubated eggs, and others with naked young. Within a week he revisited the rookery and found the babies with the

black down coming in. On May 30 and June 3, Ray (*op. cit.*, p. 437) visited a Brandt colony where he found the birds still building nests, or beginning to lay their eggs.

Bent (1922, pp. 266-267) quotes from Loomis' account of visiting Brandt Cormorant rookeries at Seal Rocks and Point Carmel, Monterey County, in 1895. On June 25 he visited Point Carmel and found all but eleven nests with eggs apparently well incubated. Ten of the eleven nests contained young which had just hatched; in the other the young were larger. On July 2, on Seal Rocks, he found nearly all the nests with young, varying in size from newly hatched chicks to those large enough to leave the nests when approached.

Other records, from regions farther removed from San Francisco Bay, will not be quoted, though they are in general agreement with the dates given for the coast of central California.

To summarize the above evidence: May 29 marks the approximate time of hatching of Farallon Cormorants on the Farallon Islands. Three weeks from that time the young would be covered with down, and within a week or two more they would reach the stage of development shown by the bones in the mound. The date of such development, then, would be around the twenty-eighth of June. The Brandts on the Farallones were found to begin laying about the first of June. This date is in agreement with the record for Point Carmel of June 25, when incubation was approaching completion or the eggs had just hatched. About four weeks from this time, or about July 23, the young would reach the stage when they could leave the nest. The record of July 2 for Seal Rocks is somewhat earlier than this, but the period is, of course, influenced by individual nesting dates. The optimum time of obtaining young of Farallon and Brandt cormorants of the size found in the mound, is therefore from the middle of June to the last of July. The Emeryville shellmound must, then, have been occupied by the Indians during the summer.

The presence of a tarsometatarsus of a young Great Blue Heron pushes the summer occupancy of the mound back into May. Early in May the young herons are able to move about in the nests, though as yet unable to fly (Dawson, 1923, pp. 1893-94). At this time there is much squabbling as the young endeavor to push one another from the nest. The bone here referred to is possibly that of a young one which was pushed out, and failing to catch himself upon a lower limb of the tree, fell to the ground.

Undoubtedly the Emeryville site was occupied both winter and summer. Since there are no species of birds whose inhabitation of the Bay region is restricted to the intervening spring and fall months, we cannot prove from this line of evidence that the residence of the Indians was altogether continuous. Certainly, however, food was plentiful during those months and there is no reason to suppose that they should have gone elsewhere.

SUMMARY

The present paper has been concerned with a study of 4155 identifiable bird bones from a collection totaling 6700 specimens, which were obtained from the Emeryville shellmound in 1924.

The bones are in an excellent state of preservation, in spite of the fact that practically all the wing and leg bones of the larger species are broken. This breakage appears for the most part to have been accomplished before the bones were thrown into the mound. A few bones have undergone a slight degree of petrification.

Fifty species of birds have been identified in the collection. This number does not include the species of Anatidae or Laridae, each of which families is counted as one species in the total of fifty. Since the number of specimens of Anatidae is four times that of the next most abundantly represented family (the Phalacrocoracidae), and since there are some twenty or more possible species included in the Anatidae, the expected total of all species is largely to be increased. A few small shore birds and passerines also lack specific identification. These, together with the gulls, raise the total still higher, so that there are likely to be as many as seventy-five species represented.

Of the fifty species identified, thirty-three are of water birds; fourteen are raptorial (vultures, eagle, hawks, falcons, and owls), one is gallinaceous (quail), the other two, passerine (crow and raven).

Forty-five of the fifty species are found today in the San Francisco Bay region. Twenty species today present in an environment similar to that of prehistoric Emeryville are absent in the mound. Four species from the mound are absent here now, but were present within historic times; one species (*Grus mexicana*) has never before been recorded in the San Francisco Bay region. No Pleistocene species, now extinct, are present in the mound. The absence from the mound of species present today is better explained by the habits and superstitions of the Indians rather than by subsequent invasion of the

region by these species. The absence today of species present in the mound is accounted for by biological factors having to do with environmental change. The absence of extinct Pleistocene species is significant not only as furnishing added proof of the Recency of the shellmound deposits, but as illustrating that environmental factors brought about the extinction of birds of types similar to those which are dying out today, before civilized man became one of those factors.

Four facts bearing on the habits of the Indians have been brought out: (1) The broken state of the bones may indicate attempts at making whistles or other artifacts, or the manner of preparing the birds to eat; (2) we note that there are no birds represented which could not be captured in the immediate vicinity of the Bay shore, while there is a preponderance of species which could be obtained nowhere else; the inference is that the hunting range was restricted to the vicinity of this home site; (3) the presence of nestling cormorants is taken to indicate that the "Emeryville Indians" visited an island rookery, probably then existent within the bay; (4) the presence of winter-visiting ducks and geese, coupled with the occurrence of nestling cormorants, indicates continued occupancy of the shellmound site the year around.

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EXPLANATION OF PLATES

PLATE 1

The Emeryville shellmound in process of excavation in 1924.

a. View from the northwest.

b. Southerly wall of areas 28, 29, and 30. (Figs. *a* and *b* from Schenck, 1926, pl. 35.)



PLATE 2

Unassorted bones from the Emeryville shellmound.



PLATE 3

a, g, and h. Humerus, tibiotarsus, and coracoid of young cormorants; *e*, tarso-metatarsus of young heron. The fact of summer residence of the Indians upon the mound site is based upon the presence of these young birds.

b. Whistle of ulna of goose.

c. Tube of ulna of hawk.

d. Whistle of ulna of eagle, showing breakage.

f. Distal end of humerus of goose, showing transverse breakage and charred end. All approximately $\times \frac{3}{4}$.



PLATE 4

Characteristic elements of the five species of birds present in the mound but absent in the region today.

a Distal end and shaft of tibiotarsus of California Condor (*Gymnogyps californianus*)

b. Coracoid of Little Brown Crane (*Grus canadensis*).

c Proximal half of humerus of Bald Eagle (*Haliaeetus leucocephalus*).

d. Coracoid of Sandhill Crane (*Grus mexicana*).

e. Coracoid of White tailed Kite (*Elanus leucurus*)

All approximately $\times \frac{7}{8}$.



THE TWO RACES OF BLACK BEAR
IN CALIFORNIA

BY

JOSEPH GRINNELL

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THE TWO RACES OF BLACK BEAR IN CALIFORNIA

BY
JOSEPH GRINNELL

(Contribution from the Museum of Vertebrate Zoology of the University of California)

Specimens of large mammals in satisfactory condition for scientific study are notoriously difficult to accumulate in series, especially in a well-settled country. Very slowly, indeed, has this Museum's collection of California-taken material representing the black bears (subgenus *Euarectos*) accumulated to a point where it warrants doing something with the question of their systematic status. I venture now to tackle this general question only with free acknowledgment that ideally adequate material is still lacking, and that as a result I still feel unable to follow up several of the suggested lines of enquiry.

Little has been published pertinent to the immediate subject of the present contribution. Mammalogists using any scientific name at all have in most instances employed the all-inclusive one, *Ursus americanus* Pallas, for any black bear from California. This is what C. Hart Merriam (1896, p. 79) did, at least by implication, and he has generally been followed. In 1913 (p. 284) Grinnell, recognizing that Californian animals are not the same as eastern ones, used, for all the black bears of the State, the name *Ursus americanus altifrontalis* Elliot (1903). He remarked, further, that "It is possible that the black bears of the Sierra Nevada belong to a separate and unnamed subspecies." Dixon (1916, p. 68) employed the same name and used it more especially for a bear taken in Humboldt County and which he described in considerable detail, though chiefly in comparison with the grizzly type of bear. The latest general review of the black bear group, by Seton (1926, pp. 119-194, map III, p. 125), avoids any detailed consideration of the races, especially those along the Pacific coast of North America; the account of the natural history is, for all the geographic forms, lumped, save that the map shows locations of the type localities of all the theretofore named races.

Hall (1928) deals analytically with subspeciation in the black bears of the northwest coast district north of Puget Sound; he refrained from taking into account the more southern ones, knowing that Grinnell had a study of these latter long under way.

Suffice it now to say that within the State of California two subspecies of *Ursus americanus* may be recognized on the basis of cranial characters, one in the narrow northwest humid coast belt and one in the Sierra Nevada. These subspecies would appear to merit names and diagnoses as follows. In providing names, the present writer adheres to the principle, in which he believes, that any scientific name in the literature, no matter how vaguely based provided it is usable according to the rules of nomenclature, must be adopted for current use rather than a new name be proposed.

Ursus americanus californiensis J. Miller

Sierra Nevada Black Bear

Ursus americanus, of many authors (but not of Pallas), part.

Ursus Californiensis J. Miller (1900, p. 250); original description, from "California"; restricted to use for present subspecies for reasons given below, pages 399-401.

Ursus americanus altifrontalis, Grinnell (1913, p. 284), and of a few subsequent authors, part.

Diagnosis.—Cranially, as compared with *Ursus americanus americanus* (specimens from the state of New York) and with black bears from the Rocky Mountain region (*U. a. cinnamomum*?), larger; rostrum of skull relatively longer; brain-case higher; forehead rising from plane of roof of rostrum more steeply, and each frontal more bulging (see plates 5 and 6); last upper molar larger.

Basis of present diagnosis.—No. 16269, Mus. Vert. Zool., skull-only; male, adult with but slight indications of exostosis; base of mountain slope just south of "Bartolas Country". (U. S. G. S. Kernville Quadrangle), 4300 feet altitude, six miles north of Weldon, Kern County, California; shot July 14, 1911, by Frank Feldman; recovered the next day by Henry A. Carr (MS notes in Mus. Vert. Zool., p. 36).

Distribution.—The metropolis of this subspecies lies in the Sierra Nevada of California, north from Kern County to Siskiyou County. The northwesternmost skull definitely of *californiensis*, at hand, is from Callahan, Siskiyou County (no. 14712). At the southern end of the Sierra Nevada, where these mountains extend around the southern end of the San Joaquin Valley, "black" bears have been reported from localities clear into Ventura County. But I have not seen actual specimens from any place southwest of the vicinity of Walker Pass.

Ursus americanus altifrontalis Elliot

Northwestern Black Bear

Ursus americanus, of many authors (but not of Pallas), part.

Ursus altifrontalis Elliot (1903, p. 234); original description; type locality, shore of Lake Crescent, Clallam County [Olympic Peninsula], Washington; type specimen (skull) figured previously by Elliot (1899, pls. 43, 44).

Ursus americanus altifrontalis, Grinnell (1913, p. 284), and of a few subsequent authors, part.

Diagnosis.—Cranially, more like *Ursus americanus californiensis* (see *postea*, p. 396) than *U. a. americanus* or black bears from the Rocky Mountain region; general size large and last upper molar large; rostrum of skull long; brain-case still higher than in *californiensis*, and highest point shifted farther forward; brain-case narrower; forehead ("frontal shield") rising still more steeply, and frontals each bulging in extreme degree, as viewed both in lateral and in transverse profile. (See plates 5-7.)

Basis of present diagnosis.—No. 38338, Mus. Vert. Zool., skull-only, incisors and smaller premolars missing; sex not originally determined, but with no doubt whatsoever, male; age, mature adult, but not "overgrown" or showing exostosis; Clarke ranch, some eight miles southwest of Laytonville, Mendocino County, California; animal killed about October 20, 1921, but skull not recovered until some time later, after having suffered some weathering; collected by F. C. Clarke.

Distribution.—The range of this subspecies lies in the narrow humid coast belt of northwestern California and thence northward to the Olympic Peninsula in Washington. In California, specimens show that it is definitely this subspecies that occurs south to the vicinity of the Gualala River, in Sonoma County, and east to Mount Linn (vicinity of South Yolla Bolly Mountain), Tehama County. Intergradation of *altifrontalis* with *californiensis* may be conjectured to take place through western Siskiyou and Trinity counties.

General comments.—*Ursus americanus americanus*, in a strictly subspecific sense, is here considered as typified by two skulls from the Adirondack region of New York, loaned from the collection of the United States National Museum; the data and measurements for these are given in table 1. Other skulls before me from the Atlantic slope, from localities to the northward or to the southward of New York, show differences possibly of geographic significance. But it is beside the purpose of the present paper to discuss them, even if I had the knowledge and material sufficient to warrant it—which I have not.

TABLE 1

CRANIAL MEASUREMENTS, IN MILLIMETERS, AND PERCENTAGES OF BASILAR LENGTH OF CERTAIN OF THE MEASUREMENTS, OF SELECTED ADULT OR SUBADULT BEARS OF DIFFERENT RACES IN THE *Ursus americanus* GROUP.

Museum	Catalogue No.	Sex: (?) used where assumed	Locality	Basilar length (of Hensel)	Breadth of rostrum just posterior to roots of canines	Percentage of basilar length	Greatest length of molar	Percentage of basilar length	Breadth across postorbital processes	Percentage of basilar length	Mastoid breadth	Percentage of basilar length	Zygomatic breadth	Percentage of basilar length	Alveolar length of tooth-row, anterior border of canine to post. border of M ₂	Crown length of M ₁ and M ₂	Crown length of M ₂
<i>Ursus americanus californiensis</i>																	
MVZ	30116	♂	Yosemite Park, Calif.	269	69	26	84	31	116	43	143	53	198	74	107	47.0	29.1
MVZ	29803	♂ (?)	Yosemite Park, Calif.	62	80	99	144	184	100	43.5	27.0
MVZ	16375	♂ (?)	Tulare Co., Calif.	273	65	24	83	30	114	41	148	54	201	74	107	45.4	27.8
MVZ	16269	♂	Kern Co., Calif.	268	61	23	91	34	106	40	145	54	187	70	107	44.4	28.1
<i>Ursus americanus altifrontalis</i>																	
MVZ	38314	♂ (?)	Mendocino Co., Calif.	260	59	23	85	33	88	34	166	64	100	42.2	26.3
MVZ	38338	♂ (?)	Mendocino Co., Calif.	267	63	24	89	33	99	37	136	50	178	67	103	46.8	28.6
MVZ	40145	♂ (?)	Mendocino Co., Calif.	67	79	114	210	110	42.5	28.0
MVZ	20746	♂ (?)	Trinity Co., Calif.	286	71	25	89	31	113	40	152	53	200	70	112	45.4	28.5
MVZ	22978	♂	Humboldt Co., Calif.	61	79	98	138	200	101	44.9	27.3
MVZ	4678	♂ (?)	Eugene City, Ore.	260	60	23	78	30	104	40	130	50	179	69	113	44.1	26.7
<i>Ursus americanus cinnamomum</i> (?)																	
MVZ	14709	♂ (?)	Yellowstone Park, Wyo.	266	61	23	71	27	105	39	136	51	188	71	101	42.8	25.4
<i>Ursus americanus americanus</i>																	
USNM	158879	♂	Essex Co., N. Y.	259	67	26	72	28	109	42	144	56	191	73	102	45.1	27.4
USNM	2250	♂ (?)	Franklin Co., N. Y.	246	57	23	65	22	105	43	138	56	193	78	91	38.2	23.7

As regards the black bears of northwest America, the recent review by Hall (1928) serves as guide; I am accepting his conclusions throughout. While there is a chance that the bears of the Olympic Peninsula, though showing the same general features, possibly intensified, as those that I now call *altifrontalis* from northwestern California, are distinguishable from the latter, such differences, as judged from our specimen (no. 4678) from Oregon and from Elliot's (1899, pls. 43, 44) figures of the type specimen, are at best slight; and very likely individual variation, with specimens enough in hand, would obscure them to a degree not making it expedient separately to name the two extremes.

Elliot's (1903, p. 235) notions that the *Ursus amblyceps* of Baird (1859, p. 29 [not "20"]) was based on specimens from Oregon and that this name is a *nomen nudum* are both wrong. Fairly close reading shows that Baird merely used Oregon specimens, though with seeming hesitation, as representing *Ursus americanus*; and that the name *amblyceps* was definitely applied to a broad-headed, flat-browed race with type from the Coppermines, on the Gila River, New Mexico (see Baird, 1859, pp. 29, 30, 31, 60, pl. 19).

Nomenclature.—The first distinctive name that I know of to be applied to any black bear of California is *Ursus Californiensis*, bestowed by the "poet of the Sierras," Joaquin Miller (1900), in the following fashion. The book, *True Bear Stories*, contains as a sort of appendix (pp. 231–259) a section entitled "Scientific Classification of Bears." This section is stated to be "Edited by Pierre N. Beringer." While this person may have at least helped in culling from encyclopedias some of the (uncritical) information presented concerning "The Louisiana Spectacled Bear" [!], "Polar Bear," etc., when it comes to the bears of California the authorship of Joaquin Miller himself is to me clearly in evidence as regards numerous of the comments, which are in consonance with statements in the earlier parts of the book or with his own personal history.

Chapter "V" of this "Scientific" section is headed (p. 250) "The Black Bear of California. | *Ursus Californiensis*." The account beneath starts out as follows: "This bear we will label for convenience *Ursus Californiensis*, because the title of *Ursus Americanus* has dignified the small black bear of the Eastern states. There are, however, three species of the black bear in California that are known, and there may be more. The large black bear of California reaches very

large proportions. I have seen some that might weigh from 800 to 1,000 pounds. It is hunted for its fur, which is uniform in color, . . .” [etc., about two pages of inconsequentialities].

No matter how lacking in scientific acumen, no matter how trivial or even seemingly untruthful much of the accompanying text grantedly is, here, then, *are* the essentials of a scientific description. An author, Joaquin Miller, proposes a name, *Ursus Californiensis* (well constituted as to generic and specific elements), for a bear of the black group (not grizzly which he treats of elsewhere in the book) belonging in a given restricted territory, California; and said author diagnoses this black bear of California, in comparison with the eastern kind, as larger—which, as it turns out, *is* the case for *both* the subspecies in the State that I now characterize as separable from one another. In other words, as I see it, even though some of Joaquin Miller’s concepts (as to “species,” for example) are about as wrong as could be, he provided a name which is not a *nomen nudum* and which therefore can and should be used permanently for one of the races of black bear occurring in California. Let us here recall the currently accepted use of *Rafinesque’s* names!

Someone may prove reluctant to use the name *californiensis* because of its nominal similarity to the previously bestowed name [*Ursus horribilis*] *californicus*, of C. Hart Merriam (1896, p. 76, fig. 15), applied to the “California Grizzly from Monterey.” If the grizzlies and black bears should be considered as representing two separate genera, *Ursus* and *Euarctos*, as certain present-day mammalogists advise, then there would be no trouble; for the black-bear name would become, without question of conflict, *Euarctos americanus californiensis*. But after much consideration of the question, my own judgment is that the group of American black bears warrants no higher rank than the subgeneric one, by which ruling association of the specific or subspecific name *californiensis* with the generic name *Ursus* must be continued. Fortunately for the retention of *californiensis* on this score, reference to the International Rules of Zoological Nomenclature (recommendation under Article 36) shows that the names *californiensis* and *californicus* are of sufficiently different spelling to permit of using both for different specific members in the same genus.

Now as to restriction of the name *californiensis* to one of the two races of black bear distinguishable within the confines of California—and future studies might disclose another one or more: two considera-

tions present themselves, and each leads to the same conclusion. (1) When Elliot (1903) characterized and named the northwestern black bear, *Ursus altifrontalis*, whose range by the present interpretation extends down into the northern humid coast belt of California, in effect (even though he knew nothing of the status of the black bears of California or of Joaquin Miller's naming) he thereby restricted the application of the name *californiensis*, whose territory of habitation had theretofore only been stated as "California," to the race of the interior, that is, of the Sierra Nevada. The principle here followed I may term that of incidental subsequent restriction, and its recognition is illustrated by similar action elsewhere in vertebrate systematics. (2) Perusal of Joaquin Miller's True Bear Stories indicates that his experiences with black bears in California were had in the interior of the State, chiefly in the vicinity of Mount Shasta. By each of these courses of reasoning, (1) and (2), then, I have been led to fix the name *californiensis* upon the subspecies the metropolis of whose range lies in the Sierra Nevada.

Variations with age.—Through the generous personal interest of Mr. Frank C. Clarke during the past fifteen years the Museum has acquired a series of bear skulls from animals taken in the near neighborhood of his ranch near Laytonville, Mendocino County, California. These, all from one locality, are of great value in demonstrating the nature of variations in cranial features with advancing age. While I am unable to assign ages to individuals in terms of months or years, I can with fair confidence assign *relative* ages, on basis of gross size (where sex is known), degree of development of sagittal and lambdoidal ridges, degree of development of postorbital process, degree of spread of zygomatic arch, degree of closure of cranial sutures, and amount of wear on teeth.

Plate 7, from a selected series of five males from Laytonville, illustrates well the changes just specified (save for wear on teeth) and others, various minor ones, not specified. Pages of description and measurements could be devoted to recording these features which are functions of age; but they become objectively apparent enough for present purposes from the photographs, all of which in the accompanying plates have been taken by Mr. William C. Matthews, of Berkeley, with the same photographic technique. Indeed, in some ways comparisons can be made more profitably from these photographs than by handling the skulls themselves.

The obvious point here is that age variations must be accounted for rather carefully before geographic and hence phylogenetic characters are sought for and decided upon. While our series of *californiensis*, chiefly from the Yosemite region, does not afford so complete an age sequence as does the Laytonville series of *altifrontalis*, enough of the steps are represented to show that in the special diagnostic characters set forth in this paper skulls of the two forms at least from the metropolises of their ranges are to be distinguished in even the youngest ages available for study. The differential features shown in plate 7, figures at *d*, as compared with plates 5 and 6, figure *c* on each, selected skulls of approximately the same age stage, are in evidence all through the series shown on plate 7. And these differential features, tersely designated as higher brain-case and more bulging forehead in *altifrontalis* than in *californiensis*, cover, in fair likelihood, a multitude of morphological differences extending throughout the ursine organism, concerning, as they may, not only the bones of the cranium but the skeleton elsewhere, and musculature, circulation, innervation, and even the brain—these in turn correlated with differences in natural history and racial ecology. How desirable it would be to pursue racial studies of these bears into the realm of forage behavior, reaction to danger, and breeding cycle! Separate “cultures” are predictable.

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PLATE 5

Dorsal views of skulls of three subspecies of black bear, all at approximately the same stage of growth, namely, nearly or quite mature. All about $\frac{3}{4}$ natural size; for actual measurements see table 1.

a. *Ursus americanus americanus*, no. 158879, U. S. Nat. Mus. (Biol. Surv. Coll.), ♂; Newcomb Lake, Essex County, New York; October 23, 1908, C Sheldon.

b. *Ursus americanus cinnamomum* (†), no. 14709, Mus. Vert. Zool., ♂ (assumed to be); Upper Geyser Basin, Yellowstone National Park, Wyoming; killed about 1911; received from H. E. Klamer through Annie M. Alexander.

c. *Ursus americanus californiensis*, no. 16269, Mus. Vert. Zool., ♂; base of mountain slope just south of "Bartolas Country," six miles north of Weldon, Kern County, California; shot July 14, 1911; obtained by Henry A. Carr.

a

b

c

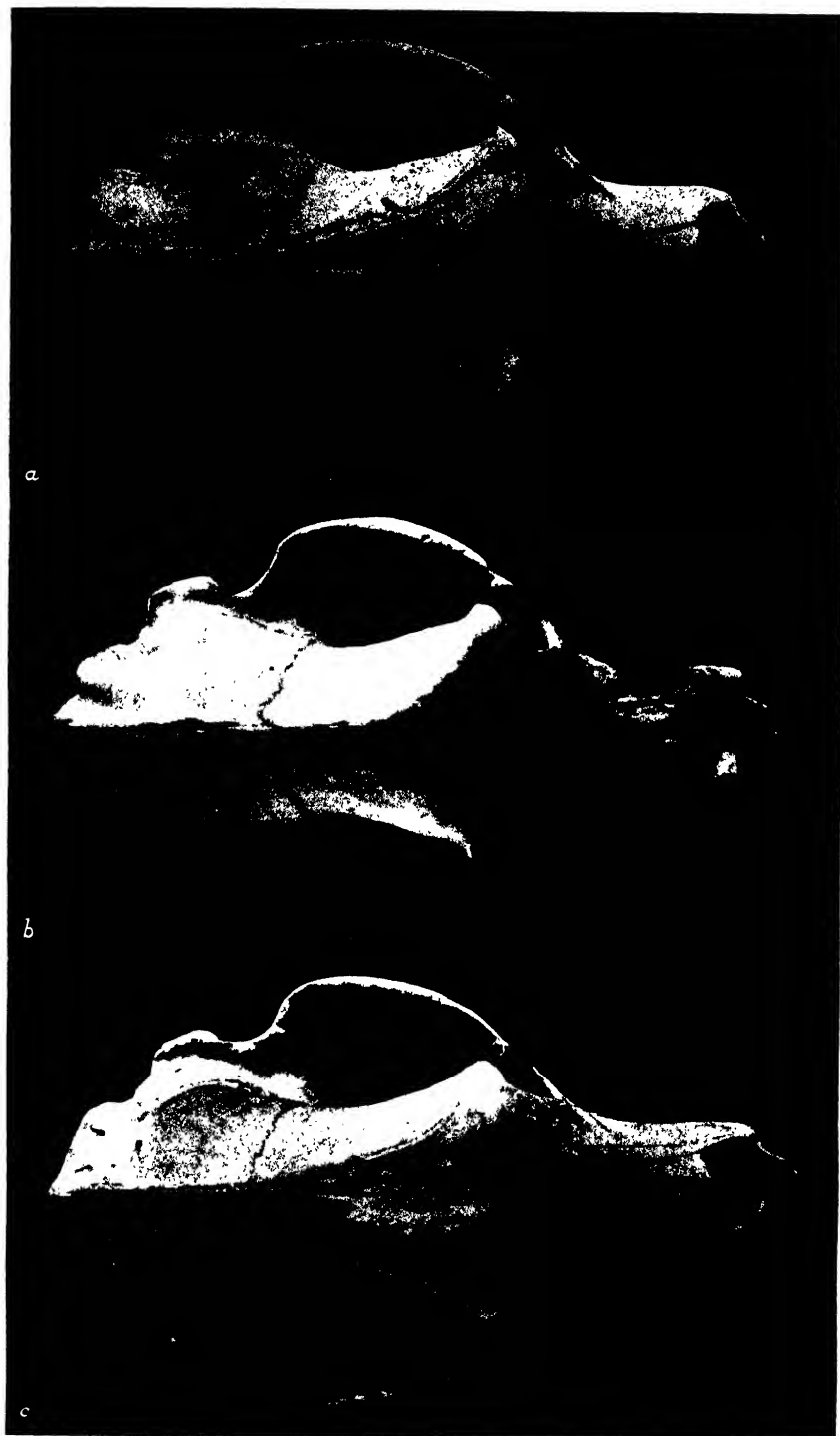


PLATE 6

Right lateral views of skulls of three subspecies of black bear, all at approximately the same stage of growth, namely, nearly or quite mature. All about $\frac{3}{4}$ natural size; for actual measurements see table 1.

a. *Ursus americanus americanus*, no. 158879, U. S. Nat. Mus. (Biol. Surv. Coll.), ♂; Newcomb Lake, Essex County, New York; October 23, 1908; C. Sheldon.

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c. *Ursus americanus californiensis*, no. 16269, Mus. Vert. Zool., ♂; base of mountain slope just south of "Bartolas Country," six miles north of Weldon, Kern County, California; shot July 14, 1911; obtained by Henry A. Carr.



PLATE 7

Right lateral and dorsal views of each of five skulls of *Ursus americanus altifrontalis*, selected to show, from top to bottom, progressive changes with advancing age. These are all of male animals collected in the one neighborhood, of Laytonville, Mendocino County, California, by Mr. Frank C. Clarke. All reduced to the same scale, approximately $\frac{3}{16}$ natural size. For actual measurements of the lower three see table 1.

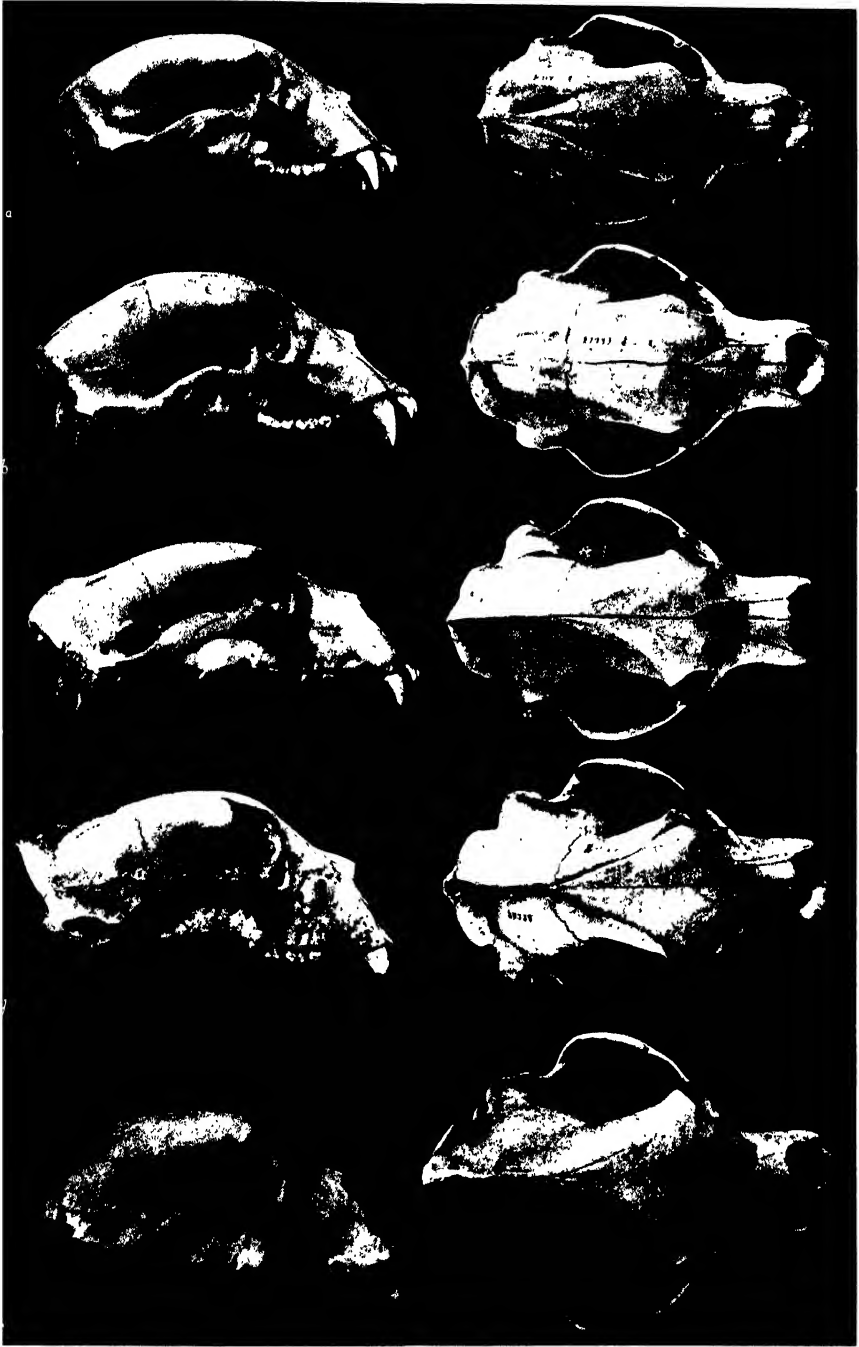
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OSTEOLOGY OF THE CALIFORNIA ROAD-RUNNER
RECENT AND PLEISTOCENE

BY

LEIGH MARIAN LARSON

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LEIGH MARIAN LARSON

(Contribution from the University of California Museum of Vertebrate Zoology)

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INTRODUCTION

The identity of the road-runner of the California Pleistocene has been assumed by Miller (1922) to be the same as that of the Recent species, *Geococcyx californianus* (Lesson). All reports upon the asphalt beds of Rancho La Brea, Carpinteria, and McKittrick have indicated the presence of *Geococcyx*, but no extended examinations have been made of the Pleistocene material to substantiate this assignment to the category of Recent. The present paper offers the results of a study of all the *Geococcyx* material available, in an effort to determine, so far as possible, the systematic position of the road-runner of middle and late Pleistocene.

It may be assumed here that the modern road-runner is the result of a marked change from the remote common cuckoo ancestry by gradually increased leg development with a corresponding reduction of the wing elements. Although Pleistocene is relatively close to us geologically, there have been faunal changes since then, and in some instances, it is judged by some students, evolutionary changes. The bird branch of the theoretical evolutionary tree was the latest great group to separate from the reptilian stock, and so the evolutionary

history of birds is comparatively late. A degree of change since Pleistocene might therefore be a logical presumption, and it has been proffered in some instances.

With reference to the road-runner, then, certain questions come to mind: First, whether the Pleistocene road-runner had more powerful and therefore more useful wings, and less developed legs, than the road-runner of the present time. Second, has the road-runner carried on further development since Pleistocene, or has it been a perfectly stable form for some one hundred thousand years? Third, if the road-runner is still evolving, what is the direction of this evolution? Fourth, does the modern California species show marked variations individually, and if so, along what lines and to what extent?

In order to proceed with this project the osteology of the Recent road-runner had to be studied and understood, so far as possible, in relation to its own habits and to those of other cuckoos. Osteological study of the Cuculiformes in general has been meager; and *Geococcyx californianus* is no exception (Pycraft, 1903, p. 258). Shufeldt (1886a) described the skeleton, but he had three specimens only, and he did not deal with variation within the species. He used this same material in his later description of the road-runner skeleton (Shufeldt, 1886b). Consequently a review of the osteology of the modern road-runner, with consideration of specific variation, seemed necessary and has proved profitable. It serves as a foundation upon which to base conclusions as to the status of the birds in Pleistocene.

ACKNOWLEDGMENTS

Grateful acknowledgment is here made to Dr. Joseph Grinnell of the Museum of Vertebrate Zoology of the University of California for his suggestions and for the opportunity to work on this problem under his guidance; to Dr. Loye H. Miller of the University of California at Los Angeles for his interest, cooperation, and assistance in gaining material; and to Dr. Jean M. Linsdale, of the Museum of Vertebrate Zoology, for assistance in putting this paper into form for publication.

MATERIALS

Pleistocene specimens available for study were few and fragmentary, owing to the scarcity of remains found in the asphalt beds. The Rancho La Brea material was studied through the courtesy of the

Los Angeles Museum; the Carpinteria road-runner fossils were received through the kindness of Dr. Loye H. Miller of the University of California at Los Angeles; and the McKittrick specimens were furnished by the Museum of Paleontology of the University of California.

Not only was the fossil material quite scarce, but the Recent material with which to compare it was also quite difficult to obtain. Representation of six individuals and two *Coccyzus* was received through loan from Dr. Miller; Mr. Charles D. Bunker (University of Kansas Museum of Natural History) sent two road-runners and three *Coccyzus*; Mr. Donald R. Dickey furnished allied cuckoo material with which to compare *Geococcyx californianus*. Mr. Charles Schnack collected five road-runners near Escondido, California, and Mr. Chester C. Lamb collected two at Todos Santos, Lower California, which are now in the Museum of Vertebrate Zoology, together with two complete and two partial skeletons that had been previously collected.

A complete skeleton of the Pleistocene bird has not been found in the asphalt beds as yet, the fossil material consisting entirely of limb bones, one scapula, one coracoid, and one pelvis. These parts are entirely satisfactory, however, as they are the bones to which one looks for indications of evolutionary change.

The material upon which this report is based can be summarized as follows:

TABLE 1
PLEISTOCENE MATERIAL

Element	Carpinteria		La Brea		McKittrick		Individuals	
	Com- plete	Frag- ments	Com- plete	Frag- ments	Com- plete	Frag- ments	Rights	Lefts
Humerus.....	1	1	9	5	1	4	11	10
Ulna.....	1	1	6	1	1	7	3
Scapula.....	1
Coracoid.....	1
Pelvis.....	1
Femur.....	1	3	1	2
Tibio-tarsus.....	3	9	6	1	8	18	9
Tarso-metatarsus.....	2	4	4	7	2	1	9	11

The Recent material examined consisted of 19 complete and 3 partial skeletons. The minimum numbers of individuals represented are 18 Pleistocene, and 22 Recent.

OSTEOLOGY

The cuckoo group is one that has long puzzled systematists to find its true relationships. It is seemingly an aberrant group, having arisen from some ancient stock, and is now rather isolated in position. Pycraft sums up the situation by saying,

Their [the cuckoos'] nearest allies, judged from an osteological standpoint, would appear to be the Coraciidae (Coraciinae and Leptosomatinae) and Bucerotidae on the one hand, and—more remotely—the Opisthocomi on the other. Their relationship to the Psittaci, which is generally agreed upon, would, I think, never be suspected from a comparison of the skeletal framework. This fact is probably to be explained by the great amount of specialization which the parrots have undergone.

The separation of the parrots and cuckoo-like birds has been advocated by Fürbringer and Stejneger as well as by Pycraft. Ridgway follows this plan and gives the order Coccygiformes followed by the order Psittaciformes.

The Cuculiformes constitute a large order, of some 202 species, and are found represented nearly everywhere over the world. Not only is this a large group, but it is a diversified one as well, and it has in it forms that are almost strictly arboreal as well as some that are almost entirely terrestrial. This, of course, also means diversified osteological structure, which is most marked in the pelvis and sternum.

Pycraft (1903) reviewed the osteological characters of the Cuculiformes in general; and the skeletal characteristics of the markedly terrestrial *Geococcyx californianus* were minutely and accurately described by Shufeldt (1886a), especially as to the skull, fore and hind limbs, and limb girdles. However, he based his conclusions on so few specimens (three adults) that he could not very well allow for individual or intraspecific variations. Accordingly, a review of *Geococcyx californianus*, osteologically, will not be amiss when only variations within the species are noted.

Axial skeleton.—The skull in *Geococcyx californianus* agrees with all known cuckoos in that the pterygoid articulates freely, by an obliquely transverse joint, with the indirectly desmognathous palatines; the lacrymals are also free; the prefrontals large; the vomer small or absent; basipterygoid processes wanting; and the post-orbital processes small.

In looking at the dorsal aspect of a series of road-runner skulls the variation at once apparent is in the relative length of the premaxilla. The range in the length of the entire skull (83.7 mm. to 94.08 mm.) is 11.6 per cent of the average. The upper mandible varies 14.1 per cent in its total length to 10.6 per cent variation in the cranial region or as 1.33:1 (see tables for basic figures). This means the variation in the total length is greater in the facial region than it is in the cranial. The lachrymals, though always characteristically large, vary in the degree to which they enclose the anterior part of the orbit. The frontal depression may be more or less marked.

The ventral aspects of these same skulls again bring out the variation in the length of the facial region due to the premaxilla and maxilla. Also it was noted that the palatine is broader and more wing-like in some individuals, and in these more closely follows the outline of the maxillo-palatine. The segments of the sclerotic ring vary in shape and in number, there being 12 or 13 present.

The length of the lower mandible also varies considerably, 13.6 per cent of the average, but the more interesting feature is the difference in the spread of the articulators, which has a range of 25.9 per cent. This indicates a large range in the width of the skulls at the quadrates. The angular process is short and blunt as in all cuckoos.

There is more variation in the vertebral column in the Cuculiformes, than in the skull. In *Geococcyx* the synsacrum is made up of 11 vertebrae and these include 2 thoracic, 3 lumbar, 2 lumbo-sacral, 2 sacral, and 2 caudal. The 18 presynsacral vertebrae are freely movable. There are 5 free caudals followed by a large pygostyle. This terminal vertebral element shows a surprising amount of variation in its structure and shape. It varies in relative diameters. In some individuals it even retains a well developed transverse process; in others this process is present though small, but it is usually entirely wanting.

Limbs and girdles.—As has already been stated, the functioning of the limbs in cuckoos varies greatly. It would therefore be of value to determine whether the wing and leg segments varied proportionately to their use in life. With so few specimens at hand very little could be done with the cuckoos in general, but the following facts can be pointed out. In comparing wing segment with leg segment (for example, ulna with tibio-tarsus) in the same birds, the accompanying

ratios result, showing the relative sizes of wing and leg (table 2). This order one can see is quite different from Ridgway's grouping of genera as given in the right column of the table.

TABLE 2
RATIO OF ULNA TO TIBIO-TARSUS

Ratio	Species	Ridgway's grouping
1 : 1.22	<i>Dromococcyx phasianellus</i>	<i>Coccyzus</i>
1 : 1.32	<i>Coccyzus a. americana</i>	<i>Coccyzus</i>
1 : 1.38	<i>Coccyzus erythrophthalmus</i> ..	<i>Piaya</i>
1 : 1.61	<i>Tapera naevia excelsa</i>	<i>Tapera</i>
1 : 1.81	<i>Piaya cayana thermophila</i>	<i>Geococcyx</i>
1 : 1.89	<i>Crotophaga sulcirostris</i>	<i>Geococcyx</i>
1 : 2.18	<i>Geococcyx velox</i>	<i>Dromococcyx</i>
1 : 2.21	<i>Geococcyx californianus</i> ..	<i>Crotophaga</i>

The one fact that can here be clearly seen is that *Geococcyx* has by far the largest leg in comparison with size of wing that is found in any known cuckoo.

In carrying the investigation of wing and leg segments farther, in *Geococcyx californianus*, it was of value to seek the degree of variation in size of the different segments (table 3).

TABLE 3
TOTAL LENGTH, RANGE IN PERCENTAGE OF THE AVERAGE

Fore limb	Per cent	Hind limb	Per cent
Scapula.....	20.9		
Furcula.....	15.2		
Coracoid	11.6		
Humerus.....	17.0	Femur.....	17.3
Radius.....	16.6		
Ulna.....	13.3	Tibio-tarsus.....	14.0
Carpo-metacarpus.....	13.5	Tarso-metatarsus.....	13.9
Average.....	15.4	Average.....	15.1

Pectoral girdle and fore limb.—Although cuckoos vary so greatly in the characteristics of the sternum, the differences in this element are slight among the road-runners themselves. The sternum has two pairs of notches; the posterior lateral process is slender but terminates

in a varying development of a large flat plate, while sometimes a secondary process develops from it. The three costal facets are preceded by a prominent sterno-coracoidal process. The carina is developed only moderately.

The furculae vary a little in the shape of the scapular tuberosity and the coracoidal facet, but the principal difference here is also in relative size. The furcular process is variously developed from a short, rounded outline to a long, spine-like, narrow one. These differences in the proximal and distal ends make the 15.2 per cent range in the total length. The clavicular shafts are long and slender.

The scapulae vary little, although the apex may be rounded or somewhat pointed. The acromion process turns forward.

The coracoid has a relatively long shaft, the sterno-coracoidal area varying somewhat in its expansion, and the sternal facet has a more or less marked articulation. The regions of the procoracoid and acrocoracoid are large.

The humerus is a remarkably constant element although there is a range in length relative to average length of 17.0 per cent. In some specimens either the deltoid ridge or the bicipital ridge may be extended. The shaft has quite a curve with a decided lack of intermuscular lines.

The radius and ulna are shorter than the humerus, a ratio of .86:1 obtaining for the latter. The radius is fairly straight except at the distal end where it curves sharply to meet the ulna. The ulna has a bowed shaft with 7 or 8 prominent papillae of the secondaries. In some specimens these are less marked than in others; in all, the distance between the last two distal papillae is greater than the distance between any other adjacent two. The prominent olecranon tapers more in some than in others. The carpo-metacarpus is one-half the length of the ulna, and compared with the humerus the ratio is .44:1.

Pelvic girdle and hind limb.—In considering the pelvis we again deal with a portion of the skeleton that has a wide range of variation in the cuckoo. In *Geococcyx* the climax of development is reached as far as pelvis is concerned—the ilia being extended both laterally and posteriorly. The width across very nearly equals the length of the vertebral elements of the synsacrum (averages: length 40.8 mm., width 41 mm.). The medial dorsal ridge extends anteriorly to, or beyond, the narrow pre-acetabular portions of the ilia. In one or two

instances the second caudal vertebra is not so completely fused to the synsacrum as in other specimens. The pectineal process is prominent and equally well developed in all the individuals. The pubis is very slender and short, but always extends to, and usually past, the posterior wing of the ilium. The characteristic lateral overhang of the ilium presents a seemingly unique form among birds.

The femur in *Geococcyx*, in contrast with its condition in other Cuculiformes, is pneumatic. The pneumatic foramen varies in size. The shaft is stout and curved with intermuscular lines running lengthwise. The femur is about 10 mm. longer than the humerus of the same individual, the ratio being 1.21:1.

The tibio-tarsus is more than two times the length of the corresponding element of the fore limb, the ulna. Here the ratio is 2.21:1. The shaft is straight and stout. In *Geococcyx* the cnemial crests are developed more extensively than in most cuckoos; the inner crest varies quite markedly in its anterior expansion. The small fibula has a relatively large and flat head and varies by 17.9 per cent in its maximum expanse.

The tarso-metatarsus is over three times as long as the corresponding carpo-metacarpus, the ratio being 3.15:1. It is also remarkably long in comparison with the other hind limb elements. The short hypotarsus is complex, possessing two grooves more or less deep. The anterior metatarsal groove varies from quite shallow to fairly deep. The outer trochlea is extended posteriorly and allows for the zygodactylism of the foot. The metatarsal facet varies considerably in distinctness and emphasis. The tarsus is about one and a half times as long as the middle toe with claw and about two-thirds as long as the entire skeleton of the wing.

This review of the individual elements in the limbs of the road-runner might be interpreted as showing that the increase in size in the leg and the reduction in the wing have occurred mostly in the distal segments. This is indicated by comparing the ratios of the corresponding segments in the same individuals:

Humerus: femur = 1:1.21

Ulna: tibio-tarsus = 1:2.21

Carpo-metacarpus: tarso-metatarsus = 1:3.15

The more one studies *Geococcyx californianus* as a species, osteologically, the more one realizes how little the individuals vary in any outstanding or vital characteristic, despite their wide territorial dis-

tribution. The individual skeletal elements vary in total size, but the proportions vary relatively little. Whether this size difference is due to sex or to age could not accurately be determined with the specimens in hand, owing to insufficient data. There is no evidence of a tendency to split into geographic races.

In turning to the Pleistocene road-runner and comparing the material with the modern series, it is at once apparent that it at least falls within the modern genus *Geococcyx*. The ratios of the various segments and the configurations of the bones would be bases usable in this material for determining specific relationships. Accordingly, exact measurements were taken of all the material, Recent and Pleistocene, and these were recorded by tables and graphs (not presented here).

Care had to be used in determining which measurements would be dependable and worth recording. Then, as a great deal of the Pleistocene material is fragmentary, ways of measuring had to be devised by which the greatest proportion of the material might be used.

As a side issue, the possibility arose that in preparation of modern skeletons some distortion or shrinkage might occur. If this were true, the accuracy of the measurements might be questioned. Consequently in four of the road-runners prepared as skeletons, the bones were not allowed to dry at once, but they were kept under water until measured as to total length. Then, as they gradually dried, a series of four measurements was taken at various times in order to find the degree of shrinkage. Total lengths of the following bones were recorded in a table: skull, lower jaw, sternum, furcula, coracoid, scapula, humerus, ulna, radius, carpo-metacarpus, sacrum, femur, tibio-tarsus, tarso-metatarsus, pygostyle, and tendinous bone. It was at once apparent that the bone shrinkage is negligible, usually only .1 mm. or less and never exceeding .3 mm., unless it concerns cartilaginous tissue.

As a result of working with both the modern and the fossil skeletons a technique of measurement was developed that proved satisfactory. Figures 1-3 illustrate the manner of taking measurements.

After this system of measurement had been devised, all the material, both Recent and Pleistocene, was carefully measured and recorded in tables. To include all the figures here is not feasible, so only a summary thereof is given in tables 4 and 5.

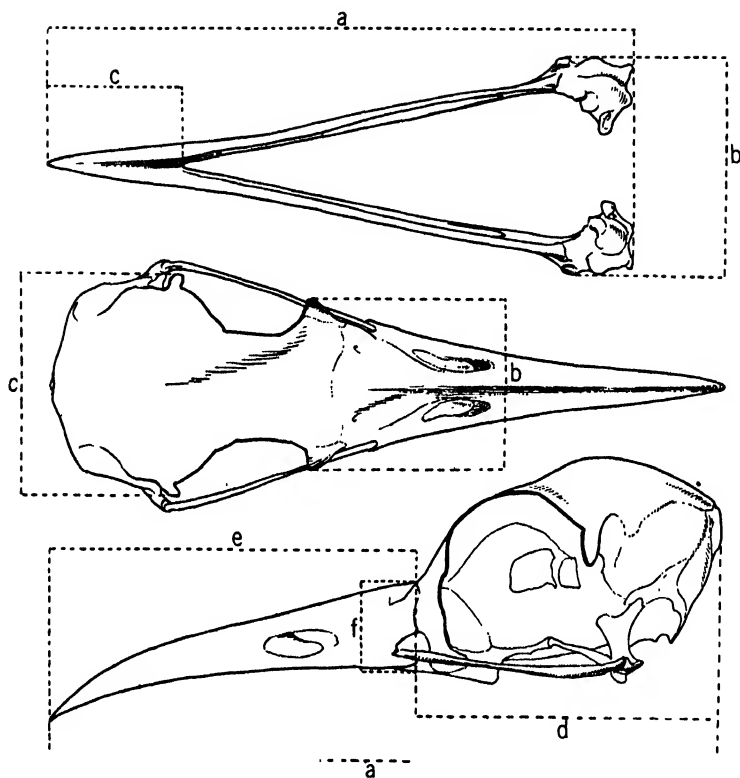


Fig. 1. Illustrating the manner of taking measurements in the skull. Skull: *a*, total length; *b*, width at lachrymals; *c*, width at posterior-orbital processes; *d*, length of cranium; *e*, length of upper mandible; *f*, height of upper mandible. Lower jaw: *a*, total length; *b*, width at articular area; *c*, length of symphysis.

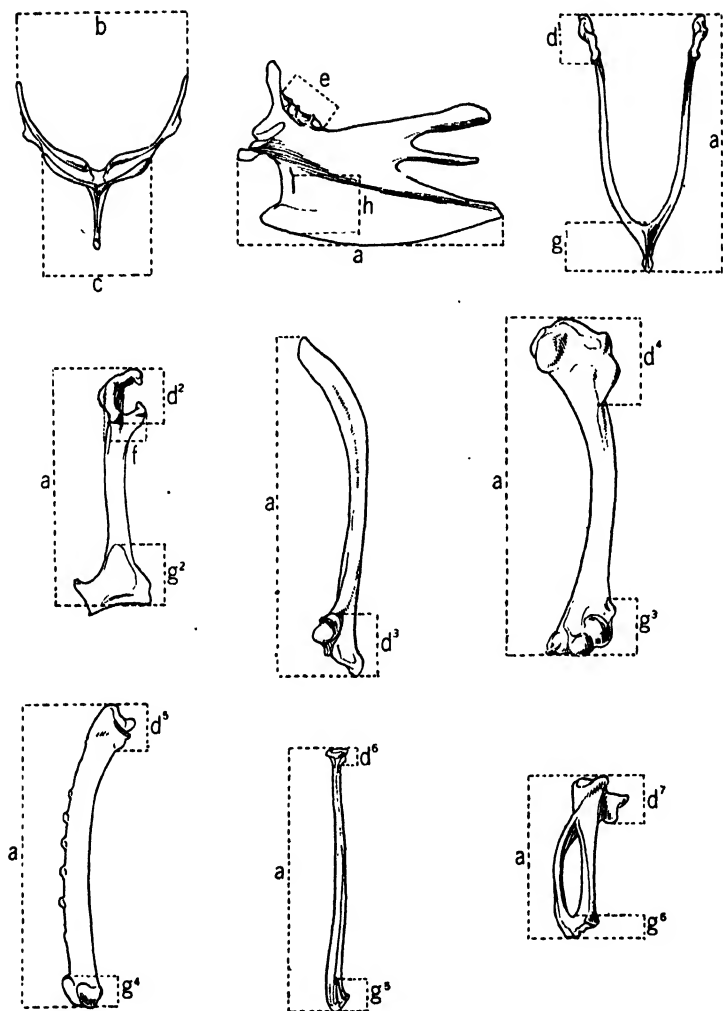


Fig. 2. Illustrating the manner of taking measurements of the fore limb and girdle bones. *a*, Total length; *b*, maximum distance across hyposternal processes; *c*, distance across ventral lips of sternum; *d*¹, distance from tip of scapular facet to below coracoid facet; *d*², distance from tip of acrocoracoid to below scapular facet; *d*³, distance from tip of acromion to below glenoid facet; *d*⁴, distance from articular head to end of deltoid ridge; *d*⁵, distance from olecranon tip to below anterior articular ligament; *d*⁶, distance from proximal extremity to below ligament papilla; *d*⁷, distance from carpal trochlea to pollical facet; *e*, length of costal margin of sternum; *f*, right-left diameter of proximal end of coracoid; *g*¹, length of symphysis of furcular process; *g*², distance from coraco-brachialis attachment to distal end; *g*³, distance from ectepicondylar prominence to base of external condyle; *g*⁴, length of condyle; *g*⁵, distance from top of tendinal groove to tip of distal extremity; *g*⁶, distance through distal metacarpal symphysis; *h*, height of carina of sternum.

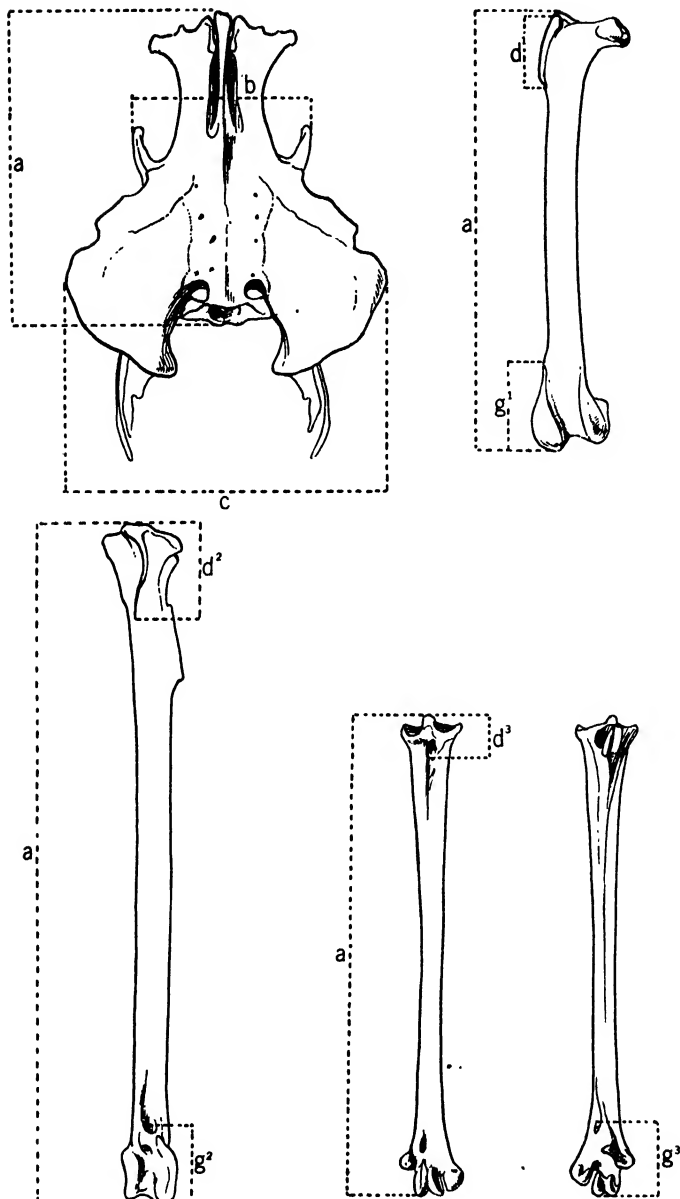


Fig. 3. Illustrating the manner of taking measurements of the posterior limb and girdle bones. *a*, Total length; *b*, width across iliac crest; *c*, width across pectineal processes; *d¹*, distance from tip of greater trochanter to base of trochanteric ridge; *d²*, distance from tip to base of inner cnemial crest; *d³*, distance from crest to below tubercle for tibialis anticus; *g¹*, length of external condyle; *g²*, distance from top supratendinal ridge to tip of external condyle; *g³*, distance from metatarsal facet to tip of third trochlea.

GENERAL DISCUSSION

The road-runner is a cuckoo which runs, and it shows in its skeleton this adaptation to a cursorial mode of living. The wing is complete and still in some measure functional, but it is little used; the leg has taken over the chief rôle in locomotion. The wing has been reduced and the leg increased in size and function; this adaptation has taken place primarily in the distal segments of the limbs.

The modern humerus would appear to average slightly smaller than the Pleistocene one; but then it is to be noted also that the Pleistocene specimens fall within the range of the modern species. There is also a very slight indication that the shaft tends to be a little stouter in the Pleistocene birds. The Pleistocene ulnae, too, while falling within the modern range, average slightly larger than the Recent ones. The differences noted here, however, are too slight, in view of the small number of specimens available, to be really significant.

Thus in two characteristic wing elements, the Pleistocene birds resemble the Recent nearly to a point of identity; they certainly show no outstanding change since Pleistocene time. The statement can definitely be made that the Pleistocene wing was no smaller than the Recent one, and so slight is the difference in average that really there is no indication that the wing of the Pleistocene road-runner was to any marked degree larger, or more developed, than the wing of the Recent road-runner.

In all three segments of the leg (femur, tibio-tarsus, tarso-metatarsus) the Pleistocene range of variation corresponds closely with the modern range. The modern femur and tarso-metatarsus average slightly smaller than in the Pleistocene birds, but, on the contrary, the Pleistocene tibio-tarsus averages slightly larger than in the Recent. This is noteworthy in that there are more fragments of tibio-tarsus than of any other element, and it is here that the Recent and Pleistocene phases so nearly correspond. These figures certainly indicate that the Pleistocene and the Recent road-runner were practically identical as to leg segments.

The indications are, therefore, that the evolution the road-runner has undergone must have taken place altogether previous to the later half of the Pleistocene. Since, by some estimates, the Rancho La Brea deposits containing the road-runner remains studied were formed

TABLE 4
CERTAIN DIMENSIONS, IN MILLIMETERS, OF ROAD-RUNNERS

Measurements	SKULL (Recent)						LOWER JAW (Recent)		
	Total length	Width at lachrymals	Width at postorbital process	Length of cranium	Length of upper mandible	Height of upper mandible	Total length	Width at articular area	Length of symphysis
Number of bones.....	16	7	15	16	19	20	14	14	19
Minimum.....	83.70	19.40	26.30	34.00	49.10	10.42	73.30	23.90	15.00
Maximum.....	94.08	22.10	29.40	37.79	56.60	11.92	84.10	31.20	22.13
Average.....	89.10	20.76	28.20	35.98	53.12	11.44	79.31	28.10	18.87

Measurements	FURCULA (Recent)						STERNUM (Recent)			
	Total length	Width through proximal ends	Length of proximal end (see fig. 2, d')	Length of distal end (fig. 2, g')	Anterior-posterior diameter of shaft	Right-left diameter of shaft	Total length	Distance across hyposternal processes	Distance across ventral lips	Length of costal margin
Number of bones.....	16	15	16	18	20	20	19	15	17	18
Minimum.....	30.00	18.50	5.80	5.90	.50	.95	32.20	19.41	14.28	5.00
Maximum.....	35.00	26.44	7.70	8.88	1.00	1.30	39.50	29.20	16.80	6.80
Average.....	32.93	21.04	6.55	7.28	.68	1.14	35.63	24.62	15.54	5.81

TABLE 4—(Continued)

Measurements	RADIUS (Recent)						
	Total length	Ant.-post. diameter of shaft	Right-left diameter of shaft	Length of proximal end (fig. 2, d ⁶)	Maximum ant.-post. diameter of proximal end	Maximum right-left diameter of proximal end	Length of distal end (fig. 2, p ⁶)
Number of bones.....	19	19	19	19	19	19	19
Minimum.....	33.18	1.20	1.20	1.80	2.70	2.90	4.59
Maximum.....	39.10	1.80	1.82	2.45	3.40	3.20	6.80
Average.....	35.69	1.45	1.46	1.97	3.05	3.07	5.53
Measurements	CARPO-METACARPUS (Recent)						
	Total length	Ant.-post. diameter of both shafts	Right-left diameter of shafts	Length of proximal end (fig. 2, d ⁷)	Maximum ant.-post. diameter of proximal end	Maximum right-left diameter of proximal end (fig. 2, p ⁷)	Length of distal end
Number of bones.....	19	17	19	19	19	19	19
Minimum.....	18.40	4.30	2.50	4.40	6.70	4.20	2.50
Maximum.....	21.10	5.10	3.20	6.13	7.30	5.40	3.61
Average.....	19.99	4.65	2.83	5.53	7.04	4.69	3.10
Measurements	FIBULA (Recent)				PYGOSTYLE (Recent)		
	Total length	Length of proximal end	Maximum ant.-post. diameter of proximal end	Maximum right-left diameter of proximal end	Total length	Maximum ant.-post. diameter	Maximum right-left diameter
Number of bones.....	12	19	19	19	15	15	15
Minimum.....	34.10	6.40	5.91	2.10	21.10	82.90	3.50
Maximum.....	49.10	20.64	7.10	2.80	24.90	94.50	9.83
Average.....	38.93	15.47	6.63	2.41	23.45	89.60	4.96

some 100,000 years ago, we may infer the evolutionary process in the case of this bird to have been an exceedingly slow one, in terms of years.

When it is realized how constant is the modern species as to range of variation, structurally, these facts are not so surprising as they would otherwise seem. When a limited range of variation within a species is found it usually indicates a mature stage in phyletic evolution (W. D. Matthew, MS). It is in groups where individual variation is large that one finds evolutionary changes going on.

So in the road-runner we have a bird that has evolved along specialized lines, but which reached its climax before Pleistocene time. Since then it has maintained itself with very little variation or change. Our present evidence indicates that the Pleistocene road-runner is practically identical with the Recent species and that both should be designated *Geococcyx californianus* (Lesson).

As the road-runner provides one of the most promising cases in which bird evolution might have occurred since Pleistocene, it is quite probable that study on other bird remains will also indicate very little or no evolution in skeletal characters since middle Pleistocene. Changes in the bird fauna after Pleistocene would seem to have been in the nature of extinction rather than in the line of expanding evolution.

SUMMARY AND CONCLUSIONS

In preparation of skeletons, bird bones do not shrink to any marked extent in the drying process.

There is a marked skeletal uniformity in the Recent road-runner, the same species ranging without appreciable geographic variation through southwestern United States, northern and central Mexico, and Lower California.

The adaptation that has taken place, through long past time, in the limbs of the road-runner is most marked in the distal segments.

The road-runner has not appreciably changed in its structure since middle Pleistocene time. There are no indications of any evolutionary trends, but all the implications are that the road-runner had already become closely adapted to its environment, perhaps nearly or quite as far as it is likely to go under the present circumstances.

The Pleistocene road-runner may properly be designated *Geococcyx californianus* (Lesson), and may be thought of as having occupied the same ecologic niche as at present.

TABLE 5
CERTAIN DIMENSIONS, IN MILLIMETERS, OF RECENT AND PLEISTOCENE
ROAD-RUNNERS

Measurements	SCAPULA (Recent)					
	Total length	Length of proximal end (fig. 2, d ²)	Dorsal-ventral diam. of shaft	Right-left diam. of shaft	Maximum dor.-vent. diam. of prox. end	Maximum right-left diam. of prox. end
Number of bones.....	20	19	19	19	19	19
Minimum.....	37.20	7.50	2.20	.90	4.80	2.90
Maximum.....	45.20	9.10	2.90	1.25	6.72	4.00
Average.....	38.31	7.97	2.61	1.07	5.65	3.49
Pleistocene						
1 specimen.....		8.09	3.22	1.50	6.50	4.11

Measurements	CORACOID (Recent)								
	Total length	Ant.-post. diameter of shaft	Right-left diameter of shaft	Length of proximal end (fig. 2, d ²)	Max. ant.-post. diameter of proximal end	Max. right-left diameter of proximal end	Length of distal end (fig. 2, d ²)	Max. ant.-post. diameter of distal end	Max. right-left diameter of distal end
Number of bones.....	18	19	19	20	19	19	18	18	18
Minimum.....	29.38	1.80	2.18	7.20	5.75	3.19	8.20	8.80	2.31
Maximum.....	33.00	2.20	2.95	8.39	7.19	4.80	10.20	11.50	4.50
Average.....	31.20	2.06	2.53	7.82	6.26	4.13	8.89	10.24	3.25
Pleistocene									
1 specimen.....	33.82								

Measurements	SACRUM (Recent)		
	Total length	Width through iliac crests	Width through pectineal proc.
Number of bones.....	16	18	17
Minimum.....	37.50	36.90	21.46
Maximum.....	43.50	44.60	24.80
Average.....	40.79	41.02	23.57
Pleistocene			
1 specimen.....	48.30	45.80	

TABLE 5—(Continued)

Measurements	HUMERUS (Recent)								
	Total length	Ant.-post. diameter of shaft	Right-left diameter of shaft	Length of proximal end (fig. 2, d ⁶)	Max. ant.-post. diameter of proximal end	Max. right-left diameter of proximal end	Length of distal end (fig. 2, g ⁶)	Max. ant.-post. diameter of distal end	Max. right-left diameter of distal end
Number of bones.....	19	20	20	20	21	21	20	20	20
Minimum.....	41.22	3.20	3.00	12.60	10.38	6.50	6.49	8.90	5.20
Maximum.....	48.90	3.80	3.80	15.20	13.60	10.50	8.10	10.60	6.90
Average.....	45.27	3.48	3.32	13.83	11.17	8.85	7.36	9.60	5.67
Measurements	Pleistocene								
	Total length	Ant.-post. diameter of shaft	Right-left diameter of shaft	Length of proximal end (fig. 2, d ⁶)	Max. ant.-post. diameter of proximal end	Max. right-left diameter of proximal end	Length of distal end (fig. 2, g ⁶)	Max. ant.-post. diameter of distal end	Max. right-left diameter of distal end
Number of bones.....	11	17	17	14	7	7	14	13	13
Minimum.....	43.98	3.40	3.12	12.25	10.80	6.84	6.83	8.90	5.11
Maximum.....	48.62	3.89	3.87	15.00	12.08	10.25	7.91	10.41	6.29
Average.....	46.17	3.68	3.44	14.00	11.50	8.59	7.36	9.68	5.57
Measurements	ULNA (Recent)								
	Total length	Ant.-post. diameter of shaft	Right-left diameter of shaft	Length of proximal end (fig. 2, d ⁶)	Max. ant.-post. diameter of proximal end	Max. right-left diameter of proximal end	Length of distal end (fig. 2, g ⁶)	Max. ant.-post. diameter of distal end	Max. right-left diameter of distal end
Number of bones.....	19	19	19	19	19	19	19	19	19
Minimum.....	36.10	2.20	3.10	4.86	5.00	4.62	4.60	3.86	3.95
Maximum.....	41.30	2.60	3.90	7.20	6.19	6.00	5.90	4.60	5.70
Average.....	38.95	2.41	3.42	6.17	5.46	5.27	5.25	4.25	4.97
Measurements	Pleistocene								
	Total length	Ant.-post. diameter of shaft	Right-left diameter of shaft	Length of proximal end (fig. 2, d ⁶)	Max. ant.-post. diameter of proximal end	Max. right-left diameter of proximal end	Length of distal end (fig. 2, g ⁶)	Max. ant.-post. diameter of distal end	Max. right-left diameter of distal end
Number of bones.....	8	10	10	7	8	7	6	7	6
Minimum.....	35.25	2.19	2.99	5.20	5.00	5.20	5.20	3.80	4.90
Maximum.....	41.40	2.60	3.90	6.90	6.20	5.90	5.90	4.51	5.52
Average.....	39.21	2.45	3.42	6.25	5.52	5.60	5.65	4.18	5.08

TABLE 5—(Continued)

Measurements	FEMUR (Recent)								
	Total length	Ant.-post. diameter of shaft	Right-left diameter of shaft	Length of proximal end (fig. 3, <i>d</i> ¹)	Max. ant.-post. diameter of proximal end	Max. right-left diameter of proximal end	Length of distal end (fig. 3, <i>g</i> ¹)	Max. ant.-post. diameter of distal end	Max. right-left diameter of distal end
Number of bones.....	21	21	21	21	21	21	21	21	21
Minimum.....	49.34	3.80	3.90	9.40	5.50	9.80	11.00	8.00	9.50
Maximum.....	58.80	4.50	4.90	10.99	9.20	11.90	14.10	9.70	10.80
Average.....	54.50	4.18	4.26	9.82	7.66	10.40	11.80	8.77	10.09
Measurements	Pleistocene								
	Total length	Ant.-post. diameter of shaft	Right-left diameter of shaft	Length of proximal end (fig. 3, <i>d</i> ¹)	Max. ant.-post. diameter of proximal end	Max. right-left diameter of proximal end	Length of distal end (fig. 3, <i>g</i> ¹)	Max. ant.-post. diameter of distal end	Max. right-left diameter of distal end
Number of bones.....	3	3	3	4	4	4	6	6	6
Minimum.....	51.20	4.30	4.00	9.90	7.70	10.10	10.90	8.40	9.43
Maximum.....	58.20	4.80	5.10	11.20	8.60	12.10	12.90	9.00	10.90
Average.....	52.50	4.57	4.43	10.35	8.13	11.19	11.84	8.74	10.16
Measurements	TIBIO-TARSUS (Recent)								
	Total length	Ant.-post. diameter of shaft	Right-left diameter of shaft	Length of proximal end (fig. 3, <i>d</i> ²)	Max. ant.-post. diameter of proximal end	Max. right-left diameter of proximal end	Length of distal end (fig. 3, <i>g</i> ²)	Max. ant.-post. diameter of distal end	Max. right-left diameter of distal end
Number of bones.....	17	18	18	19	18	19	18	18	18
Minimum.....	80.00	3.09	3.66	12.40	11.89	9.72	8.00	7.87	6.88
Maximum.....	92.00	3.80	4.82	15.00	14.45	11.50	10.10	8.90	8.20
Average.....	85.92	3.41	4.27	13.52	13.52	10.96	9.09	8.42	7.45
Measurements	Pleistocene								
	Total length	Ant.-post. diameter of shaft	Right-left diameter of shaft	Length of proximal end (fig. 3, <i>d</i> ²)	Max. ant.-post. diameter of proximal end	Max. right-left diameter of proximal end	Length of distal end (fig. 3, <i>g</i> ²)	Max. ant.-post. diameter of distal end	Max. right-left diameter of distal end
Number of bones.....	4	23	24	7	3	6	24	23	24
Minimum.....	84.55	3.30	3.82	13.20	12.28	10.15	8.60	7.38	6.30
Maximum.....	90.10	3.99	5.05	14.42	13.90	11.50	10.65	8.90	7.98
Average.....	86.17	3.50	4.39	14.01	13.31	10.98	9.45	8.34	7.42

TABLE 5—(Continued)

Measurements	TARSO-METATARSUS (Recent)								
	Total length	Ant.-post. diameter of shaft	Right-left diameter of shaft	Length of proximal end (fig. 3, <i>g</i> ¹)	Max. ant.-post. diameter of proximal end	Max. right-left diameter of proximal end	Length of distal end (fig. 3, <i>g</i> ²)	Max. ant.-post. diameter of distal end	Max. right-left diameter of distal end
Number of bones...	17	18	18	18	18	18	18	18	17
Minimum.....	58.98	2.10	2.90	7.10	7.90	7.90	10.05	5.90	8.00
Maximum.....	67.75	2.61	3.83	9.32	9.10	9.10	12.30	7.20	8.78
Average.....	62.93	2.39	3.44	8.24	8.42	8.25	10.55	6.60	8.31
	Pleistocene								
	8	11	11	13	16	17	10	8	8
Number of bones..	8	11	11	13	16	17	10	8	8
Minimum.....	60.15	2.08	3.10	7.10	7.71	7.30	9.00	5.41	7.31
Maximum.....	68.99	2.45	3.91	9.10	8.90	8.65	16.20	7.20	8.50
Average.....	62.69	2.24	3.46	8.00	8.35	8.17	10.67	6.22	7.95

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NOTES ON THE RANGE AND LIFE-HISTORY
OF THE PACIFIC FRESH-WATER TURTLE,
CLEMMYS MARMORATA

BY
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NOTES ON THE RANGE AND LIFE-HISTORY OF THE PACIFIC FRESH-WATER TURTLE, *CLEMMYS MARMORATA*

BY
TRACY I. STORER

(Contribution from the Division of Zoology, College of Agriculture, University of California)

The Pacific Fresh-water Turtle, *Clemmys marmorata* (Baird and Girard), is, save for one local species in extreme southern Lower California, the only native fresh-water chelonian on the Pacific Coast of North America, west of the Sierra Nevada-Cascade divide. It ranges from Vancouver Island and the mainland of British Columbia to northern Lower California.

All but two of the localities of record are west of the divide indicated. The species has been found in the Mohave River, San Bernardino County, and about the Klamath Lakes, and in the vicinity of Klamath Falls, Oregon (Van Denburgh, 1922, p. 976). It has also been reported to occur at Walla Walla, Washington (Van Denburgh, *loc. cit.*). This evidently is on the basis of the account published by Lord (2, 1866, pp. 100-102, 301) for Fort Walla Walla, as the California Academy of Sciences has no specimen from that district. A perusal of Lord's description led me to believe that he actually had in hand specimens of another species, *Chrysemys marginata bellii*, and this belief was strengthened by the fact that Gray, the describer of *bellii*, put Lord's reference on *Actinemys marmorata* (Gray, 1873, p. 33) in the synonymy of *Chrysemys bellii* with a distinct entry "not [of] Agassiz." This belief was subsequently confirmed by the receipt of several specimens of *bellii* from Walla Walla, obtained through the persistent efforts of Mr. Philip H. Pope. Mr. Pope has been unable to obtain specimens of *marmorata* from his locality and *bellii* is evidently the only species present. In Lower California *marmorata* has been taken at El Valle de la Trinidad (Mus. Vert. Zool., no. 10494, December 11, 1926) and at San Telmo in the San Pedro Mártir region (Mus. Vert. Zool., nos. 9818-19, June 17, 1925). The range of *Clemmys marmorata* is therefore as stated in the opening paragraph.

This is to be expected on zoogeographical grounds, as Pacific slope species do not ordinarily penetrate so far into the Great Basin territory as Walla Walla; the fauna there includes a number of eastern species (see Dice, 1916, p. 330). *Aspidonectes californiana* described by J. J. Rivers (Proc. Calif. Acad. Sci., ser. 2, 2, 1889, pp. 233-236) was evidently based upon a specimen introduced from China (see Van Denburgh, *ibid.*, ser. 4, 7, 1917, pp. 33-35).

The arid western portion of North America is poorly supplied with chelonians, the condition here being in striking contrast to that in the Mississippi Valley and eastern United States where several ecologic types are to be found in any one geographic locality. In the Pacific district, west of the Sierra-Cascade divide there is only one species of pond or "mud" turtle (*Clemmys marmorata*). Another pond species (*Chrysemys marginata bellii*) inhabits the northern part of the interior Great Basin, while a third (*Kinosternon sonoriense*) ranges northward from the Sonoran Province of Mexico and reaches the drainages of the Gila and Lower Colorado rivers. Two species of *Kinosternon* have been reported from Arizona, but the evidence available to Van Denburgh (1922, pp. 971-972) indicated that probably only one species is present, divisible into western (Arizona: *sonoriense*) and eastern (Texas: *flavescens*) subspecies. One species of box turtle (*Terrapene ornata*) lives in the mountains of southeastern Arizona near the Mexican border, and an exclusively terrestrial tortoise (*Gopherus agassizii*) inhabits the deserts of southeastern California, Arizona, and New Mexico. Over most of the territory west of the Rockies only one chelonian is to be found in any one locality; the niches of *Gopherus* and *Clemmys* meet where the Mohave River traverses the western part of the Mohave Desert, and *Gopherus* neighbors on *Kinosternon* along the Lower Colorado and Gila rivers. *Terrapene* is evidently in a higher life-zone and thus separated from *Gopherus* in southeastern Arizona.

This sparsity of chelonian fauna is paralleled by the condition among amphibians and fishes (Storer, 1925, p. 18), and is due to the general scarcity of water with corresponding lack of diversity in aquatic niches in the arid southwest.

Clemmys marmorata in the northern part of its range inhabits the Transition Zone, while through most of California it is found chiefly in the Upper Sonoran Zone. The northwesternmost station of occurrence for the species in California is Lake Leonard, about twelve miles

northwest of Ukiah, Mendocino County, which is just a short distance within the coast redwood belt (humid Transition Zone). Interiorly, to the north it has been recorded at Lierly's ranch, four miles south of Mt. Sanhedrin, Mendocino County (Mus. Vert. Zool., no. 5099). In the Sierra Nevada the same slight penetration of the Transition Zone is evident, the easternmost locality of record at hand being Smith Creek, six miles east of Coulterville, Mariposa County, at an altitude of 3000 feet. This is just a short distance within the yellow pine belt (arid Transition Zone). The species is present generally in the foothill streams of the Sierra Nevada, in the streams of the Coast Ranges (except as indicated for the northwestern portion of the state), along the sloughs and large rivers tributary to the Sacramento and San Joaquin rivers (and in the upper non-saline portions of these two rivers), and in the streams of the western drainage slopes in southern California.

A word of caution is needed regarding unusual geographical records for reptiles, especially turtles. Automobile travelers are prone to "collect" such animals and transport them. The animals may be lost from the automobile in transit or may be released in localities utterly new for the species. Important extensions of range henceforth must be very well authenticated.

The habits of *Clemmys marmorata* are in general like those of other pond turtles: the animals spend much time sunning themselves on rocks or logs in the quieter waters and take refuge below the surface at the first hint of danger. The species is in evidence for about six months in the warmer portion of the year, disappearing toward the end of September and reappearing in late March or early April. Numbers are to be seen congregated in favorable locations. Mr. Leo K. Wilson reports that, in Putah Creek, in the vicinity of Davis, Yolo County, as many as two dozen adults have been seen in a pool not over 20 by 35 feet in extent. With the advance of summer, the flow of the stream becomes reduced and the water is resolved into a series of pools with at most only a few shallow riffles connecting adjacent pools. In the early morning and early evening hours the adults may be observed traversing these shallow riffles. During the middle of the day they are accustomed to remain in the deeper pools. Turtles are not infrequently caught by persons engaged in deep fishing for bass; they are attracted to hooks baited with angleworms, dead minnows, grasshoppers, or pieces of liver.

The sight of these turtles in detecting the approach of a person seems to be acute as they usually do not permit of close approach and specimens are therefore not easy to capture save where come upon in shallow water or on land. This species is at times met with on land, but these excursions may be solely for the purpose of depositing eggs and so made only by females. This needs confirmation.

TABLE 1

DATA ON THE BREEDING ACTIVITIES OF *Clemmys marmorata* IN CALIFORNIA

Locality	Date	Remarks	Authority
.....	Three eggs in June and another in August		Van Denburgh, 1897, p. 32
Putah Creek, in Solano Co. near Davis	"about the first of June, 1922"	Two soft-shelled young	L. K. Wilson (Storer, MS)
1½ mi. NE. of Mendota, Fresno Co.	June 4, 1918	One egg from pen where turtles were confined	Mus. Vert. Zool., J. Dixon, MS
Lake Leonard, 12 mi. NW. of Ukiah, Mendocino Co.	June 18, 1922	Adult seen ascending hillside	Storer, MS
Lake Leonard 12 mi. NW. of Ukiah, Mendocino, Co.	June 21-July 2, 1922	Female captured June 15 laid 7 eggs between these dates	Storer, MS
Davis, Yolo Co.	June 21, 1929	Captive laid 5 eggs	Storer, MS
East side of Lower Klamath Lake, Siskiyou Co.	June-July, 1918	Female collected June 18 laid 9 eggs in June and 2 on July 21	Calif. Acad. Sci., Nos. 47479-89
Stanislaus Co. near Modesto	July 8, 1922	Female killed, contained 8 eggs; one of these removed and hatched	Storer, MS
West fork San Gabriel River, Los Angeles Co.	July, 1906	One egg found with a female that contained two more	Grinnell and Grinnell, 1907, p. 19
Creeks near Marysville Buttes, Colusa Co.	"during July"	"about a dozen eggs in a nest"	Sam Lamme (Grinnell, MS)
Putah Creek, Solano Co., near Davis	"early summer"	Female found dead, contained 11 eggs with formed shells	L. K. Wilson (Storer, MS)
Putah Creek Cañon, (Solano Co. side) 3 mi. SW. of Winters	Aug. 21, 1928	Empty shells about a nest	Storer, MS

Information concerning the breeding season of this turtle is rather meager. Table 1 includes all the data accessible to me. It may be inferred that egg deposition usually occurs in June but that eggs may be laid as late as August. Captivity is known to delay egg deposition so that the season may be shorter than otherwise indicated.

The turtle captured at Lake Leonard, on June 15, 1922, was kept in captivity at Berkeley, and deposited seven eggs as follows:

Date of laying	Hour of laying	Weight in grams	Measurements in millimeters
June 21.....	About 8:30 a.m.	11.0	37.0 x 21.9
June 21.....	9:25 a.m.	11.0	37.8 x 21.8
June 21.....	9:58 a.m.	10.85	37.0 x 21.7
June 22-23....	Between 4:30 p.m. and noon...	11.5	37.1 x 22.6
June 26.....	11:15 a.m.	10.8	37.8 x 21.3
July 2.....	Two eggs laid after 4 p.m., July	11.8	35.4 x 22.2
	1 and before 8 a.m., July 3	11.1	37.8 x 21.7

These are the only data available indicating the rate of deposition of eggs. Individuals of eastern species of turtles in the wild have been observed to lay all their eggs on one day within a short space of time (see Babcock, 1919).

Two distinct types of habitat seem to be used by *Clemmys marmorata* for oviposition. Along the courses of the large rivers, eggs are deposited in the sandy banks, but in the foothill regions such information as is at hand indicates that the females ascend hillsides, even to considerable distances, to deposit the clutch of eggs. In some instances it may be that a warmer habitat is thereby secured; in others no logical explanation for the hillside location is evident. Grinnell and Grinnell (1907, p. 19) state that along the west fork of San Gabriel River in 1906, "in July turtle tracks could be seen in many directions over the sand, where the animals had wandered at night away from the stream [probably en route to spawning places—T.I.S.]. By following these tracks, one turtle was found half-buried in the warm sand about thirty feet from the stream, and close to her an egg completely hidden in the sand. This turtle was dissected and found to contain two more eggs." The two turtle trappers mentioned below, both stated that they found "nests" in the sandy river banks. Van Denburgh (1922, p. 977) states that "in riding along the east side of

Lower Klamath Lake, June 12, 1918, a number of these turtles were caught crossing the road. They were large females and probably were looking for suitable places to lay their eggs."

At Lake Leonard, in Mendocino County, Miss Una Boyle has told the writer of finding young turtles in late summer in a sandy field about a quarter-mile distant from and fully 300 feet in altitude above the margin of the lake where the adults ordinarily live. The turtles evidently make this, for them, long and steep climb to place their eggs in situations which will gain a greater amount of heat than the rocky, forest-shaded borders of the lake.

In Putah Creek Cañon, about three miles southwest of Winters, in Solano County, on August 21, 1928, Dr. E. H. Taylor and the writer discovered eggshells of *Clemmys marmorata* near a small excavation in the sun-baked soil of a steep hillside between 200 and 300 feet above the bed of the creek. The earth in the excavation was soft; that surrounding the excavation was so hard as not to be cut readily with a pocket knife. The shells were outside the excavation and broken. In this instance the bank of the creek was warm and sandy so there is no evident explanation for the hillside location chosen.

Mr. Leo K. Wilson reports that late in summer along Putah Creek in Solano County south of Davis, many young individuals are to be seen in pools or in shallow riffles connecting the then diminishing pools of water. As many as thirty young have been counted in a pool about 20 by 50 feet in extent. These young are in all probability from eggs deposited in the adjacent creek banks, since the nearest hills are more than 10 miles distant.

Mr. S. Beck, of San Francisco, has told me that turtles (*marmorata*) shipped in from various places in California often deposit eggs in captivity. He reports having succeeded in hatching numerous young in sand boxes placed on the roof of his store in the mild climate of San Francisco, but the young died immediately after birth—he thought from desiccation.

The eggs of *Clemmys marmorata* are elliptical-oval in outline. Specimens at hand range in size from 32.8 to 40.6 millimeters in length and from 19.7 to 22.6 millimeters in diameter; the lot of eleven from Lower Klamath Lake averaged 34.6 by 20.7 millimeters; the set of seven from the Lake Leonard female, 37.1 by 21.9 millimeters. The shells are hard, the surface of the eggs is white without pigment of any sort and with a mat surface texture. A few surface checks or cracks were evident on some shells.

Young individuals of *marmorata* are not common in collections and data regarding growth are scarce. I have examined the following specimens from California:

TABLE 2
GROWTH DATA OF YOUNG *Clemmys marmorata* IN CALIFORNIA

Collection and No.	Locality	Date	Total length of Carapace in mm.	Age or growth stage
M.V.Z. 5911	6 mi. NE. Coulterville, Mariposa Co., 3000ft. alt.	June 5, 1915	27.8	Beginning second season
C.A.S. 27937	Duncan's Mills, Sonoma Co.	April 13, 1911	28.7	Beginning second season
C.A.S. 28016	Skaggs Springs, Sonoma Co.	April 20, 1911	29.6	Beginning second season
M.V.Z. 8012	Lankershim, Los Angeles Co.	May 11, 1917	30.8	Beginning second season
M.V.Z. 9988	2 mi. E. Paynes Creek P. O., Tehama Co.	June 5, 1924	32.0	
M.V.Z. 3826	Mill Creek; 2 mi. NE. of Tehama	June 8, 1912	33.8	Beginning second season
C.A.S. 13643	Carmel, Monterey Co.	June -, 1908	48.7	In second season of growth
M.V.Z. 7416	6 mi. NE. Coulterville, Mariposa Co., 3000ft. alt.	July 17, 1920	58.0	In third season of growth
M.V.Z. 3827	3 mi. W. Vacaville, Solano Co.	July 2, 1912	58.5	Beginning third growth stage
M.V.Z. 6720	Lower Coyote Creek, near Alamitos, Orange Co.	Summer 1916 or 1917	64.0	Beginning third growth stage
M.V.Z. 6847	1½ mi. N. Mendota, Fresno Co.	June 6, 1918	66.0	Well started in third growth stage
M.V.Z. 6246	Dunlap, Fresno Co., 2000 ft. alt.	Oct. 1, 1916	71.5	In fourth growth stage
M.V.Z. 5914	Pleasant Valley, Mariposa Co.	May 30, 1915	74.0	Early in fourth growth stage
M.V.Z. 6719	Lower Coyote Creek, near Alamitos, Orange Co.	Summer 1916 or 1917	79.5	In fourth growth stage
M.V.Z. 6718	Lower Coyote Creek, near Alamitos, Orange Co.	Summer 1916 or 1917	95.0	In fifth growth stage

Sexual dimorphism is quite evident in the older examples of *Clemmys marmorata*. Males are characterized by a concave plastron, the concavity being deepest at the junction of the abdominal and femoral scutes, the tail is blunt at its base, the cloacal aperture is at or beyond the posterior margin of the carapace, and the terminal portion of the tail is bluntly tapered. In females, the plastron is flat or even slightly convex, the cloacal aperture is usually anterior to the posterior margin of the carapace and the terminal portion of the tail is more slender. In a series of specimens, males seem to be on the average thinner, dorso-ventrally, than females. Differences with respect to the position of the cloacal aperture are evident in even the small immature examples so that it may be that secondary sexual characters are in evidence before the gonads begin to produce functional gametes.

There is considerable variation in the outline of the carapace as viewed from above, in the cross-sectional curvature of the carapace at different levels, and in the degree to which the marginal plates are flared upward from the general curve of the rest of the carapace. The specimens in hand, from various points in California, have a little more of the "marmorate" pattern on females than on males. A few examples of both sexes show slight indication of a mid-dorsal "vertebral" ridge, while this is entirely lacking in others.

The outline of the shell as viewed from above varies, even in the young. Three young examples (3826, 5911, 8012, Mus. Vert. Zool.) differ among themselves, the first having the greatest width anterior to the mid-point of the carapace, the latter two being broadest well posterior to the mid-point of the shell.

A series of specimens of *Clemmys marmorata* in the sales tanks of S. Beck and Company, San Francisco, received by purchase from various places in the Sacramento and San Joaquin valleys, was measured by me on October 16, 1925. Sex was determined by the concavity of the plastron in males; total length was measured in a direct line from the anterior edge of the nuchal plate to the posterior edge of the hindmost marginal plate of the carapace. A random series of 17 females ranged from 138 to 160 (mean 147.8) millimeters. Four large females measured and weighed: 167 mm., 1 lb. 6 oz.; 175 mm., 1 lb. 12 oz.; 180 mm., 2 lb. 1 oz.; 183 mm., 2 lb. even. A series of 24 males measured 135 to 162 (mean 151) millimeters in length. Five large males measured and weighed: 168 mm., 1 lb. 7 oz.; 177 mm.,

1 lb. 9 oz.; 177 mm., 1 lb. 1 oz.; 183 mm., 1 lb. 7 oz.; 183 mm., 2 lb. 1 oz. These large individuals are somewhat larger than any seen by me in collections.

The epidermal scutes of turtles bear ridges or "growth rings," evidently reflecting periods of high and low nutrition, a smooth area of growth being terminated by a distinct line. In highly aquatic species such as *Chrysemys picta* the scute of a completed period of growth is usually molted during the next period of increase in size (Agassiz, 1857, p. 260). But an impression of the margin of the earlier scute remains. On very old individuals the impressions of the earlier scutes may be practically obliterated, whereas on young and middle-sized turtles there may be from one to a dozen distinguishable growth lines. The important question as to whether these successive lines are annual or whether more than one may be developed in a single season seems not to have been determined. Agassiz (1857, p. 292) apparently believed that the lines were annual in character. In the most complete study of turtle growth ever published in this country (Hildebrand, 1929, on *Malaclemmys centrata* and *M. pileata*) this problem seems not to have been considered.

The youngest examples of *Clemmys marmorata* examined (Mus. Vert. Zool., nos. 5911, 8012, Calif. Acad. Sci., 27937, 28016) all show the granulated rough-surfaced scutes of the hatching stage plus a slight smooth increment on the medial margins, indicative of the beginning of a second growth stage. On the first two specimens mentioned the area on the plastron where the yolk stalk was attached in embryonic life is still soft and dark colored. This may be interpreted to mean that these individuals had been hatched the summer previous to collection. Although the total number of young at hand is limited (see table 2) those taken in the earlier months of the warm period of the year show narrow growth increments, while the few taken later in the summer exhibit wider growth bands. On the larger individuals growth increments are more numerous, twelve being the greatest number determinable with certainty on any particular individual examined. In the Beck sales tanks five females showed total lengths in millimeters and counts of growth increments as follows: 138-10, 140-9, 143-10, 149-7(or 8), 149-11. Twelve males gave the following results: 135-7+, 142-9, 147-12, 148-8(or 9), 148-8, 148-11+, 148-12(or 13), 148-12, 149-8, 156-7+, 157-8, 162-11(or 12). In a few instances (where indicated by the + sign), the impressions of the youngest

growth stages had disappeared. Hildebrand (1929) has shown that in populations of *Malaclemmys* raised in captivity the form of the growth curve varies somewhat for different annual broods even when reared under practically comparable conditions. Much more variability would be expected in a wild stock living under natural conditions and in a mixed sample drawn from different portions of the state.

Agassiz (1857, 1, pp. 292 *et seq.*) made an elaborate study of growth in *Chrysemys picta*, based upon a large number of individuals collected in the spring upon emergence from hibernation. He found that "during the first six or seven years the rate of growth is so uniform that numerous specimens collected at the same time are readily arranged in sets of the same age, simply by the difference they show in their size" (p. 292). Pearse (1923, p. 148) has studied the increase in size of tagged specimens of *C. picta* at Madison, Wisconsin. The increase in weight and length is large, 20 per cent or more during the first four years after which it dropped to 6 per cent or less. He infers that at 12 years an individual would measure 135 millimeters in total length and that an individual 150 millimeters long would be about 25 years old.

Turtles of temperate regions hibernate regularly, like other reptiles, during the colder portions of the year. They are active throughout the warm period. Other reptiles are known to molt, some species more than once, during the season of activity. Whether turtles develop more than one growth increment during a single warm season cannot be inferred from the data now in hand. But it may safely be inferred that the age in years is not greater than the number of growth "rings" exhibited and so a maximum or outside limit of age may be set. Referring again to the five females and twelve males listed above, such a conclusion would indicate that the growth rate of *Clemmys marmorata* is more rapid than that of *Chrysemys picta* studied by Agassiz and Pearse and of *Malaclemmys* studied by Hildebrand. There are probably inherently different growth rates for different species of turtles. The long hot summer period in interior California with consequent higher stream and pond water temperatures and longer period through which aquatic food species suitable for turtles are available would be favorable for rapid growth in a poikilothermous species such as *Clemmys marmorata*. Tagging of young individuals with frequent subsequent recapture by use of small mesh traps would probably afford a definite answer to this problem of "increment rings" and age.

The methods used by turtle trappers in procuring the animals for market are indicated by the following two accounts.

Mr. Sam Lamme, of Live Oak, Sutter County, used to "fish for terrapin" (*C. marmorata*) as a business, shipping his catch to San Francisco where it was in demand by exclusive clubs and by the Chinese. The animals brought \$3 to \$6 per dozen and were most in demand about April. The turtles were caught in nets baited with meat or fish as an attractant, and the nets were placed so that the imprisoned turtles could rise for air. If held under water for three hours the turtles would drown; yet they go down and hibernate in the mud at the bottom all winter, that is, during November, December, and January. The turtle traps were visited daily and two dozen per day was considered a fair catch. The eggs are deposited in July, in sand bars, buried shallowly in the sand, "about a dozen" in one nest (MS notes taken by J. Grinnell, March 2, 1923).

The following extended description was written after visiting and talking with a trapper ("Bill" Ayres) at Whites Bridge Slough, near Mendota, Fresno County, on March 16, 1923 (T. I. Storer, MS).

Ayres was just then getting ready to "turtle" (i.e., to trap for turtles). A fish net, of "gill" type, with diamond-shaped meshes about $1\frac{1}{4}$ inches wide was made into a barrel shape about 24 inches in diameter and 48 inches long, a ring of heavy galvanized iron wire at each end, and a third at the middle supporting the net. Two strips of redwood, one on either side, with a nail at each end to catch against the wire rings, were used to keep the net taut and also to cause it to float, partly immersed in the water. In the circle of wire at each end an inwardly directed funnel was constructed, also of net, with a central opening oval in shape, about 8 inches in width and $\frac{1}{2}$ to 1 inch in height, the edges of the opening being reinforced with cord. A pair of crossed strings on the center ring supported the meat or fish used within the trap as bait.

The trap is set in a "likely" place, along a slough where turtles are common. The turtles do not enter a trap at once, but may rest on top of it for several days before entering. Evidently they do not feed until hungry. Then several may enter at nearly the same time. The trap when unencumbered, floats at the surface. If it were to sink when containing turtles the latter would soon drown and then be unsuited for marketing. When turtles have been caught in a trap

they regulate their own specific gravity and the concerted effort is to sink or raise the trap according to the "mass action" of the contained animals.

Periodically the traps are visited and any turtles which have been captured are taken to an old wooden scow, resting half in the water on the bank of the slough. The submerged portion of the scow is partly filled with mud and the portion above water with dry sand. The scow is screened over with poultry netting to prevent escape of the captured turtles. There are shelves on the side on which turtles can rest and sun themselves. An abundance of food such as carp chopped in pieces is provided. The turtles feed at intervals. Ayres said that after a group of the animals had fed they would retire into the mud for a time and another group would appear above and subsequently they too would feed.

In September, or whenever the weather begins to turn cold, Ayres buried his turtles, putting them under a layer of mud about 3 inches deep, over which was scattered an accumulation of leaves about 8 inches in depth. Each turtle would establish a circular hole in the mud through which it could breathe.

Sand is provided in the pen in which females deposit eggs. Ayres has found turtle eggs buried in the bank adjacent to a slough.

For shipment to market the turtles are packed in grain sacks. Of the largest [which were reported to be up to 10 inches in length and 7 to 8 inches in breadth, though I have never seen one over $7\frac{1}{2}$ inches long—T.I.S.], $4\frac{1}{2}$ dozen constitute a sackful. The largest are shipped out in December, then bringing \$4 or more per dozen. At that time other trappers are also shipping and only the largest turtles get the top price. In January the medium sized individuals are sent to market, and finally, in February the smallest, when as much as \$3 per dozen is realized for turtles but little over 3 inches in length.

In the autumn of 1925 the largest dealer in turtles in San Francisco told me that he was paying the trappers \$3 to \$5 per dozen for turtles.

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THREE NEW POCKET GOPHERS
FROM UTAH AND NEVADA

BY

E. RAYMOND HALL

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THREE NEW POCKET GOPHERS FROM UTAH AND NEVADA

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E. RAYMOND HALL

(Contribution from the University of California Museum of Vertebrate Zoology)

In handling a recent collection of mammals from Utah donated to the California Museum of Vertebrate Zoology by Miss Annie M. Alexander, the writer was so impressed by the external differences showing between a series of topotypes of *Thomomys perpallidus aureus* J. A. Allen and two series of specimens of the same group from more northwestern localities in Utah that he was led to study the specimens more closely and to make comparisons with materials from near-by areas. The result is the recognition of two new subspecies in Utah and one in eastern Nevada. The area occupied by these three new forms is one where the *perpallidus* group of gophers previously was not known to occur.

Each of the three new forms, as compared with a series of fifteen topotypes of *Thomomys perpallidus aureus*, differs in the following selected points: size less; upper parts darker; underparts colored essentially as upper parts rather than white; dark post-auricular patch larger; skull smaller; palatal pits shallower; interpterygoid space not U-shaped and without rather than with central spicule of vertical lamina of palate; palate between teeth more nearly flat; premaxillae extending farther posteriorly to nasals; jugal more vertical in dorsal view; supraorbital ridges strong rather than weak or wanting.

Selected points of difference in which each of the three new forms differs from a series of thirty topotypes of *Thomomys perpallidus canus* Bailey are as follows: size less; color less gray, above and below; skull smaller and markedly less flattened in posterior view; median lamina of palate short and not forming a central spicule; palatal pits shallower; palate, between tooth rows, more rounded longitudinally; dentition relatively weaker; tympanic bullae relatively, as well as actually, smaller; premaxillae extending farther posteriorly to nasals, and more attenuate posteriorly; maxillo-frontal suture on top of skull straight or convex posteromedially rather than concave postero-medially.

As compared with a series of ten topotypes of *Thomomys perpallidus amargosae* Grinnell, each of the three new forms differs as follows: coloration more buffy (except possibly in the Snake Mountain form which has the nose black or dark gray instead of brown); rostrum weaker; zygomatic arches less angular anteriorly; skull less constricted interorbitally; mastoid and zygomatic breadths less.

Differences separating the new forms, one from the other, are set forth under diagnoses.

***Thomomys perpallidus albicaudatus*, new subspecies**

Type.—Male, adult, skull and skin; no. 43971, Mus. Vert. Zool.; Provo, 4510 feet altitude, Utah County, Utah; October 17, 1929; collected by Annie M. Alexander, original no. 506.

Diagnosis.—Size: Small (see measurements). Claws on fore feet of medium length. Color: upper parts near (13"n) black [color terms according to Ridgway, Color Standards and Nomenclature, 1912], lighter below with near (15"e) pinkish cinnamon on inguinal and pectoral regions and a slight "wash" of same color on sides; nose black; distal half, or a little less, of tail white. Skull: interpterygoid space broadly V-shaped; palatal pits of medium depth; maxillo-frontal suture on top of skull straight; lacrymal processes small and peg-like; zygomatic process of maxilla (viewed dorsolaterally, from directly above) markedly convex anteriorly and thickened little or none at junction with jugal; jugal, just posterior to middle, oblique; ventral margin of zygomatic process of maxilla moderately convex dorsally; nasals short; anterior margin of nasal simple; parietal ridges bowed in at two places, at frontoparietal suture and at middle of interparietal; paroccipital processes poorly developed; zygomatic arches with pronounced outward bulge in posterior half, with greatest breadth posteriorly.

Material.—Twelve skins-with-skulls from the type locality.

***Thomomys perpallidus aureiventris*, new subspecies**

Type.—Male, adult, skull and skin; no. 43980, Mus. Vert. Zool.; Kelton, 4225 feet altitude, Box Elder County, Utah; September 27, 1929; collected by Louise Kellogg, original no. 451.

Diagnosis.—Size: Medium (see measurements). Claws on fore feet short. Color: near cinnamon above and below; inguinal region white; nose blackish; more than distal half of tail white. Skull: interpterygoid space lyrate in shape; palatal pits of medium depth; maxillofrontal suture on top of skull straight; lacrymal processes large and peg-like; zygomatic process of maxilla (viewed dorsolaterally, from directly above) slightly convex anteriorly and greatly thickened at junction with jugal; jugal, just posterior to middle, vertical; ventral margin of zygomatic process of maxilla deeply concave dorsally; nasals long; anterior margin of nasal denticulate; parietal ridges usually bowed inward at two places, at frontoparietal suture and at middle of interparietal; paroccipital processes extremely well developed and extending well out from skull; mastoid breadth relatively large; zygomatic breadth usually greatest at anterior parts of arches.

Material.—Eight skins-with-skulls from the type locality.

***Thomomys perpallidus centralis*, new subspecies**

Type.—Male, adult, skull and skin; no. 41688, Mus. Vert. Zool.; 2½ miles east of Baker (1¼ miles west of Nevada-Utah boundary on 39th parallel), 5700 feet altitude, White Pine County, Nevada; May 30, 1929; collected by E. Raymond Hall, original no. 2683.

Diagnosis.—Size: Small; tail long (see measurements). Claws on fore feet long. Color: darker than cinnamon buff above; lighter below with more gray and tinge of pinkish buff on inguinal and pectoral regions; nose dark gray or sooty black; distal half, or more than half, of tail white. Skull: interpterygoid space narrowly V-shaped; palatal pits shallow; maxillofrontal suture on top of skull convex posteromedially; lacrymal processes of medium size and globose at tips; zygomatic process of maxilla (viewed dorsolaterally, from directly above) straight and moderately thickened at junction with jugal; jugal, just posterior to middle, vertical; ventral margin of zygomatic process of maxilla moderately concave dorsally; nasals long; anterior margin of nasal usually denticulate; parietal ridges usually parallel-sided; paroccipital processes well developed; zygomatic breadth about same at anterior and posterior parts of arches.

Material.—Thirty-four skins-with-skulls from a cross-section 17 miles long, of the Snake Mountains and two bordering valleys, at elevations varying from 5700 to 8600 feet. Fourteen of the specimens are actual topotypes.

Remarks.—The differential cranial characters set forth above apply to females as well as to males, but, as regards most of the characters, are more pronounced in the males.

The differences in length of claws of the fore feet in the subspecies are well indicated by the following measurements of the claw of the third digit in the male specimens: *aureiventris*, average 7.0 (minimum 6.8, maximum 7.1) mm.; *albicaudatus*, 8.1 (7.5–8.5); *centralis*, 8.4 (8.0–9.0). Similarly, the differing amounts of thickening of the zygomatic process of the maxillae where it joins the jugal are indicated by measurements, of males, as follows: *albicaudatus*, 2.2 (2.0–2.6); *centralis*, 2.6 (1.9–2.9); *aureiventris*, 3.2 (3.0–3.4).

Five specimens of *T. p. centralis* from the western base of the Snake Mountains differ from those taken on the eastern side of the mountains and in the adjacent valley in having much heavier rostrums and in being more brightly colored.

Two specimens, nos. 35357 and 35358, Mus. Vert. Zool., from Zion National Park, Utah, agree with *centralis* in extent of the post-auricular black patch and in having the underparts colored like the upper parts rather than white as in *aureus*. In skull characters these two specimens are intermediates as between *aureus* and *centralis*; but,

TABLE 1

AVERAGE, MINIMUM AND MAXIMUM MEASUREMENTS IN MILLIMETERS OF ADULT TOPOTYPES (INCLUDING TYPES OF THREE NEW FORMS) OF FIVE SUBSPECIES OF *Thomomys perpallidus*

Comparison should be made with corresponding measurements of <i>T. p. amargosae</i> Grinnell (Univ. Calif. Publ. Zool., 21, 1921, p. 240)									
Total length	Length of tail	Length of hind foot	Basilar length (of Hensel)	Greatest length of incisors	Zygomatic breadth	Maxillary breadth	Least inter-orbital breadth	Alveolar length of upper molar	Extension of premaxillae posterior to incisor
241 (220-239)	65 (58-72)	32.8 (29-35)	37.4 (34.8-39.8)	<i>T. p. aureus</i> , 6 ♂♂ 15.4 (14.2-16.2)	27.1 (25.8-29±)	21.5 (20.5-22.2)	6.8 (6.3-7.0)	8.7 (8.4-9.0)	2.0 (1.2-2.5)
228 (223-235)	65 (57-72)	30.7 (29-32)	35.4 (34.9-36.1)	<i>T. p. abicoudatus</i> 7 ♂♂ 14.0 (13.4-15.1)	26.1 (24.9-27.8)	20.5 (19.8-21.1)	6.6 (6.4-6.9)	8.1 (7.8-8.4)	3.2 (3.0-3.8)
243 (232-253)	67 (59-72)	32.0 (31-33)	36.4 (35.3-37.1)	<i>T. p. aureicinctus</i> 4 ♂♂ 14.7 (14.0-15.3)	26.5 (25.5-27.3)	21.5 (20.9-22.3)	6.6 (6.1-6.9)	7.9 (7.8-8.0)	2.4 (1.8-3.4)
237 (215-250)	75 (61-83)	30.3 (29-31.5)	36.3 (34.5-38.0)	<i>T. p. cenbralis</i> 9 ♂♂ 14.6 (13.9-15.9)	25.2 (24.6-26.1)	20.7 (19.7-21.9)	6.6 (5.8-7.2)	8.0 (7.5-8.7)	3.2 (2.2-4.5)
247 (242-253)	81 (79-83)	32.6 (31-34)	38.3 (37.4-39.2)	<i>T. p. canus</i> 7 ♂♂ 15.7 (14.3-16.5)	27.0 (25.7-28.0)	22.8 (21.8-23.6)	6.7 (6.6-6.8)	8.2 (7.9-8.5)	2.1 (1.3-3.1)
227 (224-231)	64 (60-69)	29.6 (27-31)	34.1 (33.2-34.9)	<i>T. p. aureus</i> 7 ♀♀ 13.8 (12.6-14.5)	24.2 (23.3-25.9)	19.9 (19.7-20.5)	6.8 (6.6-7.1)	8.2 (7.8-8.9)	1.6 (1.0-2.1)
211 (189-219)	64 (55-70)	30.0 (29-32)	32.5 (31.7-33.8)	<i>T. p. abicoudatus</i> 4 ♀♀ 12.9 (11.9-13.5)	22.9 (21.9-24.0)	18.8 (18.2-19.5)	6.6 (6.1-6.8)	7.7 (7.5-8.0)	2.7 (2.6-3.0)
212 (208-215)	62 (58-65)	29.5 (28-30)	32.4 (31.8-33.0)	<i>T. p. aureicinctus</i> 2 ♀♀ 12.9 (12.6-13.1)	22.9 (22.5-23.3)	19.4 (18.9-19.8)	6.7 (6.6-6.8)	7.4 (7.0-7.8)	2.8 (2.7-3.1)
214 (185-229)	67 (55-75)	28.8 (27-30)	31.8 (30.5-33.0)	<i>T. p. cenbralis</i> 17 ♀♀ 12.6 (11.9-13.8)	22.1 (21.3-23.1)	19.0 (18.2-20.1)	6.6 (5.9-7.1)	7.6 (7.0-8.0)	2.7 (2.0-3.4)
224 (214-234)	71 (61-76)	31.0 (30-32)	34.5 (33.2-35.8)	<i>T. p. canus</i> 15 ♀♀ 13.6 (13.1-14.1)	24.1 (22.7-25.2)	20.7 (19.8-21.5)	6.6 (6.1-6.9)	8.0 (7.4-8.3)	1.9 (1.1-2.4)

in the aggregate the skull characters, exclusive of the color characters cited, make them referable to *centralis*. Two specimens from St. George, Utah, also have the underparts colored like the upper parts rather than white, but are too young to show differential cranial characters. That the white belly of *aureus* is not a character confined to specimens from the type locality is attested by three specimens, nos. 32252-54, Mus. Vert. Zool., taken by Miss Alexander at Zuni Well, Navajo County, Arizona, which have white bellies and at the same time show several of the differential cranial characters assigned to *aureus*.

In the revisionary study of *Thomomys* made by Vernon Bailey (North American Fauna, no. 39, 1915) it is pointed out that: "Series of specimens from Manti and the Pine Valley Mountains, Utah, are by no means typical. . . ." Although the particulars in which these specimens depart from typical *aureus* are not mentioned, one is led to suspect, on geographic grounds and on the evidence furnished by the specimens seen from Zion National Park and St. George, that Bailey's specimens from Manti and the Pine Valley Mountains show some approach to the form here named *centralis*.

Transmitted March 19, 1930.

TWO NEW POCKET MICE,
GENUS PEROGNATHUS, FROM THE
CALIFORNIAS

BY
SETH B. BENSON

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TWO NEW POCKET MICE, GENUS *PEROGNATHUS*, FROM THE CALIFORNIAS

BY

SETH B. BENSON

(Contribution from the Museum of Vertebrate Zoology of the University of California)

A study of the pocket mice, Genus *Perognathus*, of the *californicus* group, based mainly on materials in the Museum of Vertebrate Zoology, but supplemented by specimens courteously loaned by Mr. Donald R. Dickey, the United States Bureau of Biological Survey, the Field Museum of Natural History, and Mr. Ralph Ellis, Jr., numbering in all about 450 specimens, has resulted in the recognition of a distinct race occupying the San Bernardino Mountains. Among the pocket mice recently collected in Lower California by Mr. Chester C. Lamb for the Museum of Vertebrate Zoology, there are specimens of an insular race of *Perognathus spinatus* which has hitherto not been described. I am indebted to the American Museum of Natural History for the use of comparative material. These two forms are now named and diagnosed.

***Perognathus californicus bernardinus*, new subspecies**

San Bernardino Mountains Pocket Mouse

Type.—Male, adult, skin-and-skull; no. 44094, Mus. Vert. Zool.; from two miles east of Strawberry Peak, 5750 feet, San Bernardino Mountains, San Bernardino County, California; collected September 19, 1920, by Laurence M. Huey; original no. H 631, Donald R. Dickey; presented to Mus. Vert. Zool. by Donald R. Dickey.

Diagnosis.—Similar to *P. californicus femoralis* but averaging larger and grayer; like *P. c. dispar*, but with ears, feet, and tail larger and color tone lighter; skull differing but slightly from *femoralis*, having smaller mastoids, and being larger; mastoids averaging larger than in *dispar*.

Comparisons.—In proportions *bernardinus* is most similar to *femoralis*, the external differences being chiefly ones of color. Fall specimens, in fresh pelage, differ from comparable specimens of *femoralis* in: smaller amount of black tipping on dorsal hairs; lighter colored subterminal band on each hair; less plumbeous color on base of each hair. Colors in general less intense than in *femoralis*. Differs from *californicus*, *dispar*, and *P. c. ochrus*, in: on the average, ears larger; feet larger, and tail longer; color lighter than *californicus*, and *dispar*; less yellowish than *ochrus*. Skull similar to that of *femoralis* but, on the average, longer, relatively narrower, and mastoids smaller. Skull intermediate between those of *dispar* and *femoralis*. Mastoids larger than in *californicus* and *ochrus*.

Color (terms after Ridgway, 1912).—Type: upper parts in general light ochraceous-buff, lined with black; lateral stripe, extending from cheek to heel and down forearm, light pinkish cinnamon; underparts and feet, white; tail black above, fading to Prout's brown at pencil, pure white beneath. Most dorsal hairs black-tipped, each with subterminal band of light ochraceous-buff and light mouse-gray base.

Measurements.—Type: total length, 227 mm.; tail vertebrae, 131 mm.; hind foot, 27 mm.; ear from crown, 11 mm. See table 1.

Distribution.—The chaparral slopes of the San Bernardino and San Jacinto mountains from 2500 to 6860 feet altitude. Life-zone, high Upper Sonoran. Specimens examined (in the Museum of Vertebrate Zoology unless otherwise indicated): Los Angeles County: Big Pines, 6860 feet, Swartout Valley, 1 (D. R. Dickey coll.). San Bernardino County: Devil Cañon, 2500 feet, 4 (D. R. Dickey coll.); Squirrel Inn, 5500 feet, 5 (D. R. Dickey coll.), 1 mile east Strawberry Peak, 5750 feet, 9 (D. R. Dickey coll.); 2 miles east Strawberry Peak, 5750 feet, 16 (D. R. Dickey coll.), 1 (Mus. Vert. Zool.); Santa Ana Cañon, 3000 feet, 1; Foresee Creek, 4800 feet, 5; Seven Oaks, 5100 feet, 2; Seven Oaks, 5000 feet, 1; South Fork Santa Ana River, 6200 feet, 4. Riverside County: Schain's Ranch, 4900 feet, 11; Strawberry Valley, 6000 feet, 4. Total 64.

Remarks.—Stephens (1906, pp. 172–173) stated that the pocket mice from the pine belt of the San Bernardino Mountains were very large and approached *femoralis* in skull characters, and further that *femoralis* would ultimately prove to be a subspecies of *californicus*. Grinnell (1908, p. 154) remarked that there might be a large mountain form of pocket mouse on the Pacific slope of the San Bernardino Mountains but could see no color characters. Later Grinnell and Swarth (1913, pp. 362–366) assigned specimens from the San Bernardino and San Jacinto mountains to the race *Perognathus californicus femoralis*, dropping *dispar* as synonymous with *californicus*, and reducing *femoralis* to subspecific status. The characters of the race described in this paper were not recognized by them, probably because the specimens they examined were in faded and stained spring pelage. The Dickey collection contains a large series of autumn-taken specimens, and in this series the distinctness of the San Bernardino Mountains form became at once apparent.

TABLE 1

MEASUREMENTS, IN MILLIMETERS, OF ADULT MALES OF *Perognathus c. dispar* (VENTURA COUNTY), *Perognathus c. bernardinus* (SAN BERNARDINO MOUNTAINS), AND *Perognathus c. femoralis* (SAN DIEGO COUNTY)

	Body measurements					Skull measurements											
	Total length	Tail	Hindfoot	Ear from crown	Head and body	Basilar length (groove on incisor to condyle)	Total length	Fronto-nasal	Nasal	Greatest width across mastoids	Width across mastoids behind external auditory meatus	Greatest length of mastoids	Distance between stylomastoid foramina	Interorbital breadth	Interparietal width	Interparietal length	Length of maxillary tooth rows
<i>dispar</i>	No. specimens.	15	15	15	15	15	15	15	15	15	14	15	14	15	15	15	12
	Mean.....	203	113	26	9	90	23.0	27.5	18.3	10.6	13.6	13.1	7.8	10.4	6.6	7.8	4.0
	Min.....	190	105	25	8	85	22.2	26.6	17.7	10.1	13.2	12.5	7.5	10.1	6.2	7.0	3.8
	Max.....	215	120	27	10	94	24.4	28.3	18.7	11.0	14.2	13.6	8.2	10.7	6.8	8.4	4.2
<i>bernardinus</i>	No. specimens.....	8	8	8	5	8	7	7	7	7	7	7	7	7	7	7	7
	Mean.....	223	131	28	11	93	23.9	28.5	19.0	11.1	13.8	13.3	8.1	10.4	6.9	7.7	4.0
	Min.....	210	120	26	10	80	23.6	27.6	18.6	10.7	13.6	13.0	7.8	10.1	6.7	7.1	3.5
	Max.....	235	140	29	11	96	24.5	29.3	19.3	11.6	14.2	13.5	8.4	10.9	7.1	8.1	4.6
<i>femorialis</i>	No. specimens.....	16	16	20	14	20	17	17	19	19	18	16	19	16	19	18	19
	Mean.....	216	124	27	10	91	23.6	28.3	18.6	10.7	14.0	13.4	8.4	10.5	6.9	8.0	4.0
	Min.....	201	105	25	9	79	22.5	26.8	17.7	10.1	13.7	13.0	7.9	9.9	6.5	7.3	3.5
	Max.....	227	143	28	11	100	24.5	29.1	19.3	11.5	14.2	13.8	8.9	10.9	7.2	8.4	4.4

***Perognathus spinatus lambi*, new subspecies**

Espíritu Santo Island Pocket Mouse

Type.—Female, young adult, skin-and-skull, no. 42938, Mus. Vert. Zool.; San Gabriel, Espíritu Santo Island, Lower California, Mexico; collected by Chester C. Lamb, January 19, 1929; original no. 10264.

Diagnosis.—A small pocket mouse of the *spinatus* group. Distinguished from *Perognathus spinatus peninsulæ* and *P. s. bryanti* by smaller size of head and body, smaller, narrower, more delicate skull, and much smaller mastoids.

Comparisons.—Color about as in *peninsulæ*. Three specimens of *lambi*, although taken within the same week in January, exhibit a wide range in color due to differences in freshness of pelage, and each can be matched by specimens of *peninsulæ*. However, all exhibit a more brownish tinge than most specimens of *peninsulæ* and the hair is slightly less coarse. Darker than *occultus*, *bryanti* and *margaritæ*.

Compared with *peninsulæ*: skull smaller, narrower, more delicate; zygomatic processes of maxillæ narrower and forming more acute angle with rostrum; rostrum more slender; mastoids much less inflated. No specimens at hand of *peninsulæ*, including some immatures, have mastoids as small as in *lambi*. Compared with *bryanti*: differs as above, save that certain young specimens approach *lambi* more closely in skull characters. Compared with *spinatus*: skull equal in size but more slender, more delicate, and with smaller mastoids. Compared with *occultus*: skull equal in size but much flatter. Compared with *magdalenæ* and *margaritæ*: skull smaller (basilar length of Hensel in four specimens averages 16.8 mm.).

Color.—Type (in faded pelage): upper parts in general light pinkish cinnamon heavily lined with bister; underparts, fore limbs, and feet, white, faintly washed with cream color; tail white beneath, bister above, lightest at pencil; most dorsal hairs tipped with bister, each with a subterminal band of light pinkish cinnamon, and light quaker-drab base. Some dorsal hairs longer and lacking the subterminal band; these and the dark tips of the other hairs produce the lined appearance of the pelage. Spines white. A young male, in fresh pelage, differs in being pure white beneath and darker above, the hairs being tipped with black instead of bister.

Measurements.—Type: total length, 175 mm.; tail, 105 mm.; hind foot, 23 mm.; ear from crown, 6 mm. .See table 2.

Distribution.—Limited, so far as known, to Espíritu Santo Island, Lower California, Mexico. Specimens examined: San Gabriel, 3; Espíritu Santo Island, 2 (coll. Am. Mus. Nat. Hist.).

Remarks.—It is interesting to note that all the insular races of the *spinatus* group, except *bryanti* of San José Island, have been characterized as having smaller mastoids than the mainland races. Thus Osgood (1907, p. 21) states that *Perognathus spinatus magdalenæ* from Magdalena Island, and *P. s. margaritæ* from Santa Margarita Island, have smaller mastoids than *peninsulæ* of the adjacent mainland. Nelson and Goldman (1929, p. 111) state that *Perognathus evermanni* from Mejia Island has smaller mastoids than *spinatus* of the mainland. *P. s. occultus* from Carmen Island also has smaller mastoids than have the mainland forms.

TABLE 2
MEASUREMENTS, IN MILLIMETERS AND GRAMS, OF ADULT TOPOTYPES OF *Perognathus s. bryanti*,
Perognathus s. lambi, AND *Perognathus s. peninsulae*

		Body measurements					Skull measurements												
		Total length	Tail	Hindfoot	Ear from crown	Weight	Head and body	Basilar length (groove on incisor to condyle)	Total length	Fronto-nasal	Nasal	Greatest width across mastoids	Width across mastoids behind external auditory meatus	Greatest length of mastoids	Distance between stylomastoid foramina	Interorbital breadth	Interparietal width	Interparietal length	Length of maxillary tooth rows
<i>bryanti</i>	No. specimens	7	7	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Mean.....	204	112	26	7	18.4	90	22.1	26.7	17.9	10.5	13.0	12.7	8.0	9.9	6.8	7.8	3.6	3.7
	Min.....	184	97	26	6	12.3	78	20.8	25.1	16.7	9.4	12.1	11.9	7.6	9.4	6.4	7.5	3.3	3.6
	Max.....	220	125	28	9	25.3	100	23.5	28.2	19.0	11.2	13.6	13.6	8.4	10.4	7.4	8.4	3.9	3.9
<i>lambi</i>	No. specimens	5	5	5	3	3	5	4	5	5	5	5	5	5	5	5	5	5	5
	Mean.....	188	112	23	6	14.1	77	20.3	24.9	16.8	9.7	12.1	11.7	7.0	9.4	6.2	7.4	3.3	3.6
	Min.....	175	105	22	6	14.0	70	20.1	24.5	16.5	9.4	11.7	11.5	6.9	9.2	6.0	7.1	3.2	3.4
	Max.....	200	120	25	7	14.2	80	20.4	25.7	17.2	10.1	12.4	12.0	7.1	9.8	6.5	7.5	3.4	3.8
<i>peninsulae</i>	No. specimens	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Mean.....	191	103	23	6	21.6	89	22.3	26.7	18.2	10.4	13.5	13.0	8.1	10.1	6.7	7.6	3.8	4.0
	Min.....	183	94	22	5	17.0	84	21.3	25.7	17.2	9.6	13.1	12.6	7.7	9.8	6.4	7.1	3.5	3.8
	Max.....	200	113	24	7	27.0	91	23.8	28.4	18.8	11.5	14.0	13.6	8.6	10.4	6.8	8.0	4.1	4.1

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**ADAPTIVE MODIFICATIONS IN THE
WOODPECKERS**

BY

WILLIAM HENRY BURT

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(Contribution from the Museum of Vertebrate Zoology of the University of California)

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INTRODUCTION

Members of the group of woodpeckers, because of their highly developed habit of pecking and their special method of getting about over tree trunks, possess certain structural modifications which, apparently, make them better fitted for the mode of life peculiar to them. Many authors have mentioned certain of these modifications, but few have attempted to correlate them with the habits of the birds. It was therefore with especial interest that the present writer, while studying the general morphology of the group, found a positive correlation to obtain between the relative amount of pecking done, as estimated from types of food eaten, and the amount of modification in a number of characters in the skeleton and feathers. The modification in the feathers, as has been shown in a previous paper (Burt,

1929), is found principally in the tail region where the strong rectrices serve as a support to the body while the bird is getting about over tree trunks.

Some of the earlier workers, such as Huxley (1867), Garrod (1872), and W. K. Parker (1875), have discussed more or less fully the cranial peculiarities, especially in the palatal region, of the woodpeckers. Lindahl (1879) has briefly described asymmetry in the hyoid arrangement, while Shufeldt (1900) worked out the osology of the group rather thoroughly. The work of Shufeldt, however, is almost purely descriptive. Lucas (1895) found a positive correlation between the type of tongue possessed by the bird and the manner in which the bird obtained its food.

The little that has been published on the myology of woodpeckers is scattered and confined chiefly to descriptions of Old World forms. Nitzsch and Giebel (1866), Garrod (1873), Gadow (1891), and Fürbringer (1888 and 1902) are the principal contributors to our knowledge of the musculature of woodpeckers. In the osteological part of the present study, no attempt has been made to describe skeletal parts other than what is necessary in discussing the adaptive modifications as they appear in the skeleton. The main emphasis is placed on the skull and the pygostyle—two parts of the skeleton that are highly modified for the special arboreal habits of the woodpeckers. Measurements were made of several of the skeletal parts in order to express some of the different degrees of specialization quantitatively by assigning numerical values to the bones. The following measurements were taken: greatest length of cranium, greatest width of cranium, width of cranium at auditory bullae, interorbital width, width of maxillaries at base of skull, length of mandibular ramus, greatest height of mandibular ramus, length of mandibular symphysis, greatest length of humerus, greatest length of ulna, greatest length of keel of sternum, greatest length of femur, greatest length of tibiotarsus, length of pygostyle, width of pygostyle, and length of disc of pygostyle. Measurements were made with a dial caliper which measures accurately to one-tenth of a millimeter. Only apparently perfect bones were measured. The variations in measurements and the differences in proportions in the various types studied are shown herewith in tables and in charts constructed from the tables, and are based, in most cases, on series of measurements.

In the present myological study, Shufeldt (1890), Gadow (1891), Fürbringer (1902), and Owen (1866) were used as guides in the

dissections. All the muscles were worked out in detail in the one species *Ceophloeus pileatus picinus* Bangs, and the descriptions of muscles to be set forth here are of that species unless otherwise stated. However, each genus available has been dissected to note any differences that might occur in the muscles of the head, limbs, or tail. The pileated woodpecker was selected for dissection because of its large size and because it is, in most respects, somewhat intermediate in its characters between the extremes of specialization for arboreal life.

MATERIAL AND ACKNOWLEDGMENTS

Over two hundred skeletons, including thirty species and subspecies, have been at the writer's disposal. These include skeletons of every genus of North American woodpeckers except *Campephilus*. Wet material, of the ten genera here considered, has been available for muscle dissection. •

For the loan of much of the above material the writer is indebted to the following institutions and individuals: California Museum of Vertebrate Zoology, through several of its staff members, for its skeletal collection and a number of preserved specimens; University of Kansas Museum, through Mr. Charles D. Bunker, for its excellent collection of skeletons and for a number of preserved specimens; United States National Museum, through Dr. Alexander Wetmore, for its large series of skeletons; New York State Museum, through Dr. S. C. Bishop, for a number of skeletons; Mr. Donald R. Dickey, for a number of skeletons. For additional specimens, mostly donated, the writer is indebted to the following: Mr. Charles O. Handley, Mr. James Moffitt, Dr. Charles E. Burt, Mr. Thomas T. McCabe, Mr. Owen L. Williams. The writer also wishes to express his appreciation to Dr. Joseph Grinnell for helpful suggestions and criticisms concerning the study, and to Dr. Alexander Wetmore for first suggesting the problem. The drawings were made by Mrs. Frieda Abernathy.

NATURAL HISTORY

In order to correlate the adaptive modifications of structures in the woodpeckers with their habits or daily activities, it is essential to find values indicating the respective daily activities of these birds. The feathers, muscles, and skeletal parts show modifications in various directions. We can assign quantitative values to certain of these

characters, by measurements or weights of the parts under consideration, and thus compare them one with the other. It is somewhat more difficult, however, to assign quantitative values to the daily activities of birds in the wild state. By knowing, through stomach examinations and field observations, the per cent of each of the different types of food eaten, as compared with the total amount of food and the manner in which these respective foods were obtained, we can assign comparable values to at least the food getting activities of different species of birds. For example, in the woodpeckers, if we find the larvae of wood borers as part of the regular diet of a species, we may assume without question that in the majority of cases the members of this species excavate these larvae from the wood by means of pecking. If the stomachs of a large series of individuals of another species contain large percentages of earth-dwelling ants mixed with sand and rubbish, we naturally conclude that these ants were picked up from the ground, possibly from ant hills if large numbers have been consumed, and that pecking into wood was not necessary for their capture.

Then, by computing in each species (1) the percentage of all the food that was excavated from wood or bark, (2) the percentage taken from the external surfaces of bark or poles, and (3) the percentage taken from the ground, air, or small branches, we have a rough index to the amount of time spent in pecking, in moving over tree trunks, or entirely away from tree trunks. This, of course, does not take into consideration nest building and other activities, such as drumming, that do not have to do with food getting or food storing. But, after all, much of the active time in a bird's life is probably spent in search of food, and relatively little of the entire time in nest building or drumming. The sum total of food getting activities apparently has much to do in molding the structures that have to do with the activities.

In the discussion to follow, a representative species of each genus of woodpeckers will be discussed briefly as to general habits, methods of obtaining food, type of food eaten, and the approximate percentage of time spent on tree trunks, either in search of food on the exterior or in drilling holes into bark and wood. In moving over tree trunks the bird is continually using its tail as a prop, whereas in pecking, both the skull and tail play an important part. Therefore, by studying the types of food and the percentage of each type of food eaten by representative species of each genus, we can determine approxi-

mately the amount of time spent on tree trunks and then correlate the functions of the tail and skull with the varying degrees of modification that we find in these same structures. The data for the percentages and kinds of food eaten by each form are taken from Beal (1911) and are summarized here and placed in tabular form. In certain cases it is rather difficult to ascertain exactly where the bird obtained the food, and in these cases the tables are subject to error. But we can tell fairly definitely whether or not the bird had to excavate the food from wood or bark, and this is the most important consideration in the following tables. The data for each of the following species are summed up in chart form in figure 1.

The arrangement of species to be set forth is in the order of increasing arboreal habits as indicated chiefly by food predilections. The flicker is here considered as the least arboreal and the three-toed woodpecker as the most arboreal of the genera under consideration.

***Colaptes auratus.* Yellow-shafted Flicker**

The flicker is a bird of the open country as well as of the forest. Although it usually resorts to dead trees or telephone poles for nesting sites, it spends relatively little time on vertical tree trunks or other places where it is necessary to use the tail as a prop or the bill as an organ for excavating bark and wood.

In speaking of the red-shafted flicker, the habits of which are very similar to those of the yellow-shafted flicker, Grinnell and Storer (1924, p. 343) say: "This omnivorous woodpecker then [during autumn months] almost completely forsakes the timber and forages in the brush patches, eating berries of various sorts, especially cascara; it often seeks the open meadows where it gathers ants and grasshoppers." Concerning the method of alighting on trees they say: "A bird seldom flies far before alighting, not against an upright tree trunk as with most other woodpeckers, but perching on a branch, to bow deeply this way and that and perhaps utter its explosive *clai-p*."

Newton (1893-1896) tells us that where trees were not available members of this genus have been known to make their nests in banks. Flickers are probably the least arboreal, in forage habits, of any of our North American woodpeckers as is shown by the following list of foods, taken from Beal (1911) and based upon examination of

684 stomachs collected from 35 states, the District of Columbia, and Canada. Collection was evenly distributed throughout the year so the data are fairly complete as regards food habits.

	Per cent
Predacious ground beetles	1.62
Beetles, other than predacious ground beetles	3.52
Ants, mostly earth living	49.75
Hymenoptera, other than ants04
Hemiptera, partly from tree trunks85
Orthoptera (grasshoppers, crickets, and cockroaches)	2.39
Lepidoptera, in form of caterpillars	1.28
Miscellaneous animal food, mostly from ground	1.49
Grain, mostly corn	1.12
Fruits	20.00
Seeds, mostly of <i>Rhus</i>	9.25
Mast	1.79
Miscellaneous vegetable food, mostly from ground	6.64

From the above list we can assign a small portion of the beetles, ants, Hemiptera, Orthoptera, and Lepidoptera to food taken from tree trunks. The aggregate of these would probably not exceed 10 per cent of the total amount of food consumed. The other .90 per cent is taken mostly from the ground, although some of the fruit and seeds are probably taken from small twigs. The amount of pecking for food is probably so small as to be negligible. An occasional wood-boring caterpillar and a few ants from rotten logs are evidently the only foods that these birds obtain by actual pecking. They have an extremely long tongue and can reach far into holes and crevices for insects.

***Asyndesmus lewisi*. Lewis Woodpecker**

The Lewis woodpecker is distributed irregularly throughout its range. It is usually seen in sparsely timbered areas, often on fence posts or dead trees. It is almost entirely a surface feeder, obtaining much of its food from surfaces of tree trunks, posts, or from the ground, in which respect it is very similar to the red-headed woodpecker in amount of time spent on tree trunks or poles. It also takes some of its food flycatcher fashion from the air.

The following list of foods taken from Beal (1911), based on examination of 59 stomachs from 5 states, and irregularly distributed throughout the year, does not give us a true picture of the food habits of this bird. It does give us, however, a fair idea of the places where the food is collected.

	Per cent
Beetles, mostly ground and foliage dwelling	9.12
Ants, from surfaces and from ground	11.87
Hymenoptera, other than ants	11.57
Hemiptera	1.36
Orthoptera, grasshoppers	3.20
Spiders50
Corn46
Fruit	25.55
Mast (acorns)	34.46
Seeds	2.05

There was nothing in the stomachs to indicate that this bird ever digs into wood, decayed or otherwise, for wood-boring larvae. We may assign a small portion of the beetles, about half of the ants and other Hymenoptera, most of the Hemiptera, and the spiders to the group obtained from surfaces of tree trunks or poles. The aggregate of these would probably not exceed 15 per cent of the total food. The other 85 per cent is taken, for the most part, from the ground, from small twigs or branches, and from the air in the manner of flycatchers.

***Melanerpes erythrocephalus.* Red-headed Woodpecker**

The red-headed woodpecker, throughout its range, is a familiar bird on telephone poles and fence posts, where it forages on surface insects. It is a bird of the semi-open country where there are occasional trees along streams or near habitations. Nest holes of these birds may be found in dead trees or telephone poles. Throughout at least part of its range (Kansas and Oklahoma) it often substitutes telephone poles for trees as nesting sites. It obtains much of its food from the surfaces of tree trunks or poles, using the tail to a certain extent as a prop while moving over tree trunks. Even a larger per cent of the food, however, is probably taken from the ground or from the air. This bird often plays the part of a flycatcher, darting out into the air for passing insects, then back to its perch. On returning to its perch it usually alights on the upright surface, but it is not uncommon to see a bird perch crosswise on a small branch or even on a telephone wire. The following list taken from Beal (1911), based on the examination of 443 stomachs collected from 27 states, the District of Columbia, and Canada, and representing every month in the year, gives us a representative list of foods eaten:

	Per cent
Beetles, mostly adult such as crawl over bark and poles	19.00
Ants, taken in open, partly on surfaces of trees	5.17
Hymenoptera, mostly from air	1.63
Hemiptera, mostly from surfaces of tree trunks	1.89
Orthoptera (grasshoppers, crickets, and cockroaches)	3.58
Lepidoptera, ground-living caterpillars	1.63
Miscellaneous animal food	1.00
Grain	4.25
Fruits	20.20
Mast (acorns and nuts)	23.26
Miscellaneous vegetable food	18.30

From the above list we can assign most of the beetles, ants, Hemiptera, and a small portion of the Orthoptera to food taken from trunks of trees or surfaces of poles. The whole of these would aggregate about 25 per cent of the total amount of food; this leaves approximately 75 per cent to be taken from small branches, the ground, and the air. The red-headed woodpecker probably does very little pecking except for nest building. The type of food eaten is not necessarily secured by pecking.

***Balanosphyra formicivora bairdi*. California Woodpecker**

The members of this genus are inhabitants of wooded areas, principally the oak covered foothills and mountains throughout its range. Much of the food consists of acorns, so that the range of these woodpeckers closely parallels that of the oaks. Ritter (1929) considers the presence or absence of this woodpecker to be governed, within its range, by the presence or absence of oaks. These woodpeckers, probably spend more time on tree trunks than do the red-headed woodpeckers, if we consider the drilling of holes into bark or decayed wood and the storing of acorns in these holes. They are often seen perching across a small branch near the top of a tree, from which point they dart out at intervals into the air to catch insects on the wing.

Beal (1911) gives us the following list of foods compiled from an examination of 84 stomachs taken throughout the year save in February, April, and May:

	Per cent
Beetles, exclusive of wood borers	3.00
Ants	8.09
Hymenoptera, other than ants	7.34
Miscellaneous animal food	4.49
Grain	1.00
Fruit	23.00
Acorns	53.30

Nothing in this list indicates that the bird does any pecking for insect food. It confines its pecking to making holes in which to store acorns, and to nest building. The amount of pecking done each year, however, in making new storage holes, is probably not so great as it would seem at first thought because the same old holes are, in many cases, used year after year with the addition of relatively few new holes each year. Moreover, the acorns are often stored in crevices in the bark of large trees, where practically no pecking is required. In the above list it seems reasonable to assign about half of the animal food and two-thirds of the acorns to food taken from tree trunks. Although the acorns are first taken from the ground or branches, ultimately many of them are placed in tree trunks and later either eaten in place on the tree trunk or taken to a branch to be eaten. This would give about 46 per cent of the food as being taken from surfaces of tree trunks and 54 per cent from the ground, air, or small branches.

***Centurus carolinus.* Red-bellied Woodpecker**

This woodpecker is a bird of the woods and is usually found, throughout its range, in wooded areas. It does not inhabit the open plains as does the flicker, nor the semi-open country as does the red-headed woodpecker. It is slightly more arboreal in its habits than is the red-headed woodpecker. It is seen mostly on tree trunks, where it obtains much of its food from the surfaces as does the red-headed woodpecker, but it also does some pecking as is shown by the few larvae of woodborers eaten. The following list, taken from Beal (1911) and based on examination of 271 stomachs collected in 17 states and Ontario during every month of the year, gives us a fair representation of the foods eaten by this species:

	Per cent
Predatory beetles, probably from bark of trees86
Other beetles, partly wood-boring larvae	9.32
Ants, from ground and bark of trees	6.45
Hymenoptera, other than ants	1.45
Orthoptera (grasshoppers, crickets, etc.)	5.83
Hemiptera	1.86
Lepidoptera, few wood-boring larvae	2.88
Miscellaneous animal food	2.29
Corn	3.99
Fruit	27.28
Mast (acorns, beechnuts, pecans, etc.)	30.70
Poison ivy seeds	2.15

From the above list we can assign the wood-boring larvae of beetles and of Lepidoptera to the group that requires pecking for capture.

This would probably not total more than 6 per cent of the food. The remainder of the beetles and Lepidoptera, most of the Hymenoptera, and the Hemiptera would come under the food collected from surfaces of the bark—in aggregate about 15 per cent of the total food. The remaining 79 per cent of the food was probably not taken from tree trunks, but from the ground or from small branches.

***Geophloeus pileatus.* Pileated Woodpecker**

The pileated woodpecker is primarily a forest dweller, being found usually where there are large areas of timber. It obtains much of its food from decaying logs and stumps. All this requires a considerable amount of pecking, but much of it is easy pecking, especially when it is done in decayed wood. Although a forest dweller, this bird spends much of its time on the ground in the manner of the flicker. From an examination of 80 stomachs, taken throughout the year, Beal (1911) furnishes us with the following data:

	Per cent
Beetles, mostly wood-boring larvae from rotten logs	22.01
Ants, mostly from decaying wood	39.91
Miscellaneous animal food, mostly from surfaces	10.96
Wild fruit	22.56
Seeds, mast, rubbish, etc.	4.56

In the above list beetles and ants, amounting to about 40 per cent of the total food, can reasonably be classified as obtained by pecking. The remainder of the animal food and part of the mast and rubbish, aggregating in all about 34 per cent of the total amount of food, can be classified as food obtained without pecking, but probably from the surfaces of tree trunks. This leaves approximately 26 per cent of the food to be obtained from the ground or small branches, but not from tree trunks.

***Sphyrapicus varius.* Yellow-bellied Sapsucker**

The sapsucker is an inhabitant of the wooded areas and spends most of its time, while in search of food, on tree trunks. It is, in this respect, almost wholly arboreal in its habits. The greater proportion of its food, however, is vegetable rather than animal matter.

The following list of foods, taken from Beal (1911), based on examination of 313 stomachs collected in 24 states, Canada, and the District of Columbia, and distributed over 12 months of the year, gives us a fair representation of the food of the sapsucker. This does not, however, account for any liquid food that the bird might obtain.

If this were accounted for the percentages would evidently be somewhat different.

	Per cent
Beetles, mostly from tree trunks, few wood borers	5.45
Ants, mostly from tree trunks	34.31
Hymenoptera, other than ants	2.64
Hemiptera, partly scales	1.00
Miscellaneous insects and spiders	5.44
Fruit	28.06
Cambium	16.54
Mast, rubbish, and seeds	6.09

From the above list we can reasonably assign one-third of the beetles, one-fifth of the ants, all of the cambium, and a small portion of mast to the part of the food obtained by pecking—an aggregate, in all, of about 27 per cent of the total food. The remainder of the beetles and ants, a small portion of the other Hymenoptera, the Hemiptera, and two-thirds of the miscellaneous insects and spiders can well be assigned to the food taken from tree trunks but not requiring pecking. This comes to about 38 per cent, leaving 35 per cent to be obtained from places other than tree trunks.

***Dryobates villosus*. Hairy Woodpecker**

The hairy woodpecker is confined to wooded areas. "It is eminently arboreal in its habits and gets most of its food from trees" (Beal, 1911). The bird's arboreal habits are reflected in the type of food eaten as is shown by the following list taken from Beal (*op. cit.*), based on examination of 382 stomachs obtained from 33 states and territories, the District of Columbia, and Canada, and taken in every month of the year:

	Per cent
Larvae of wood borers	31.00
Other beetles, mostly from tree trunks	9.60
Curculios and engraver beetles	3.00
Ants, mostly from tree trunks	17.00
Lepidoptera, wood-boring caterpillars	10.00
Hemiptera, mostly from tree trunks	2.41
Miscellaneous animal food	5.50
Fruit	5.22
Corn and seeds	5.87
Cambium, mast, and rubbish	11.00

From the above list of foods we can assign the wood-boring larvae of beetles and of Lepidoptera, the engraver beetles, and the cambium to the food which requires pecking on the part of the bird. These will aggregate about 45 per cent of the total food. Had we included part

of the ants, which would seem reasonable, the percentage of food obtained by pecking would be still higher. The beetles other than wood borers, the ants, the Hemiptera, and the miscellaneous animal food were probably mostly taken from tree trunks without additional pecking on the part of the bird. These aggregate about 30 per cent of the total amount of food. We have remaining 25 per cent to be gathered from places other than tree trunks.

Picoides (two species). Three-toed Woodpecker

The three-toed woodpeckers are almost wholly arboreal in their habits, and probably the most arboreal of our North American woodpeckers. This is evident both in their food and the various arboreal adaptations which are apparent throughout the body of the bird.

The food and habits of the two species of *Picoides* are so similar that the two were treated together by Beal (1911). He gives us the following list, which is based on examination of 51 stomachs:

	Per cent
Coleopterous larvae, wood-boring	62.45
Beetles other than wood borers, mostly engravers	6.90
Lepidopterous larvae, mostly wood-boring	13.70
Ants, from tree trunks	7.32
Miscellaneous animal matter	1.00
Fruit, mast, cambium, and rubbish	8.63

From the above list we can definitely assign the wood borers, engravers, and the cambium to the food which requires pecking. These total about 85 per cent of the amount of food eaten. The remainder of the beetles, the ants, and the miscellaneous animal food, amounting to about 10 per cent of the total food, can be assigned to food taken from tree trunks, but not requiring pecking. The remaining 5 per cent was probably taken from places other than tree trunks.

It is evident that this woodpecker does more daily pecking than any other kind of woodpecker under consideration. Practically all of the food must be excavated from wood, either dead or decaying.

OSTEOLOGY

In the study of the skeleton an attempt has been made to pick out certain elements that show different degrees of adaptive modification in the different genera of woodpeckers, and to attempt a correlation of these degrees of modification with the habits of the birds. In order to determine which of the characters varied most in the forms studied,

a number of measurements were made of the different elements. Table 1 lists twelve of the species examined with the number of specimens available and, for each character, the minimum and maximum measurements and the mean for each, in millimeters. In many cases, because of the small number of specimens, the conclusions derived from these figures are subject to error. However, the figures are not intended to show minute variation, but merely to indicate the general proportions in each genus examined and the general trend of the different modifications. In this table many of the subspecies have been omitted because of small series of specimens. But measurements of these conform, in all pertinent respects, with those set forth in the table. These additional measurements are filed with the original manuscript at the Museum of Vertebrate Zoology, Berkeley.

In table 2 the means for each character in each species are given in per cent of those for the character, length of tibiotarsus. The tibiotarsus is selected because it provides one of the longest measurements and is less variable in length than many of the other elements. In table 3 the means for each character in each species are compared with the means for the same character in the male flicker. In this table we can compare the characters of the specialized types with those of the generalized flicker.

The skull probably reflects, in its structure, the habits of the bird more conspicuously than does any other part of the skeleton. This part of the skeleton displays certain adaptive modifications in varying degrees in the different genera, modifications which apparently afford, for those birds that do the most pecking, a better tool with which to excavate wood.

It has been pointed out previously by Garrod (1872), W. K. Parker (1875), and others, that the woodpeckers have many cranial peculiarities. These early writers stressed particularly the structure of the palatal portion of the skull, but did not call attention to the peculiar relationship that exists between the frontals and the superior processes of the premaxillae in certain forms. Neither did they discuss the amount of modification in the premaxillae in different genera of woodpeckers.

The details of the palatal structure will not be duplicated here as they do not bear directly upon the subject of this paper. The different degrees of modification in the skulls in the respective genera under consideration will be considered and possible explanations of these differences set forth.

TABLE 2
COMPARISON OF MEAN MEASUREMENTS OF EACH CHARACTER IN EACH SPECIES WITH THOSE OF LENGTH OF TIBIOTARSUS

Species	Sex	Length cranium	Width cranium	Width at auditory	Interorbital	Width of maxillae	Length ramus	Height ramus	Mandibular symphysis	Length pygoxyle	Width pygoxyle	Length diaeo	Length humerus	Length ulna	Length sternum	Length femur
<i>Picoides arcticus</i>	♂ ♀	68.1	67.0	68.1	36.0	39.4	112.1	13.0	37.3	48.5	33.0	29.4	91.0	106.0	87.8	76.0
<i>Dryobates villosus villosus</i>	♂	72.8	63.0	63.0	29.4	31.5	109.0	14.4	32.7	47.1	30.0	27.2	91.0	107.2	82.2	70.4
<i>Dryobates villosus villosus</i>	♀	71.4	62.5	61.6	29.8	32.0	110.0	14.3	33.0	45.5	29.0	26.2	90.0	106.0	80.5	70.0
<i>Dryobates pubescens medianus</i>	♂	73.8	64.6	64.0	25.1	29.5	90.0	12.7	20.7	41.9	27.1	23.5	87.3	104.4	77.3	64.6
<i>Dryobates pubescens medianus</i>	♀	73.0	63.4	62.2	24.7	28.7	91.4	11.5	23.5	41.4	27.9	23.5	87.3	104.4	77.7	64.2
<i>Sphyrapicus thyroideus</i>	♂ ♀	59.8	53.2	56.0	23.8	27.4	92.6	10.6	26.4	44.2	28.0	23.5	91.4	112.5	82.4	65.0
<i>Xenopicus albolarvatus albolarvatus</i>	♂	67.6	60.0	59.5	23.5	30.5	103.0	14.3	31.4	45.1	28.0	25.6	90.0	108.2	80.0	65.4
<i>Ceophloeus pileatus</i>	♂	67.0	51.7	53.0	26.0	34.4	125.5	17.4	29.6	29.9	32.1	27.8	100.1	121.0	86.0	75.8
<i>Centurus carolinus</i>	♂	79.8	60.2	56.0	26.0	31.3	122.5	12.7	32.2	42.2	26.8	23.0	96.9	114.5	86.4	68.8
<i>Centurus carolinus</i>	♀	78.0	58.6	56.2	24.1	30.1	122.0	11.9	28.9	44.0	28.6	23.5	98.4	111.9	85.5	33.5
<i>Balanosphyra formicivora bairdi</i>	♂	70.1	58.1	53.5	21.2	29.0	108.9	11.4	32.0	38.3	22.3	17.7	96.0	116.5	78.8	66.0
<i>Balanosphyra formicivora bairdi</i>	♀	75.2	61.6	56.4	23.5	31.4	112.6	12.1	32.0	37.7	21.0	17.0	95.1	115.2	81.3	65.7
<i>Melanerpes erythrocephalus</i>	♂	73.6	57.2	55.2	21.8	30.6	109.6	10.7	31.5	36.5	23.2	18.1	95.0	110.2	78.4	67.2
<i>Melanerpes erythrocephalus</i>	♀	72.6	57.1	54.8	20.3	30.1	109.4	10.9	31.8	37.0	23.5	18.0	95.0	111.7	78.2	67.3
<i>Asyndesmus levisi</i>	♂ ♀	64.0	54.1	52.4	21.5	27.2	101.0	10.1	26.1	40.6	23.0	19.3	98.0	121.5	83.2	66.6
<i>Colaptes cafer collaris</i>	♂	67.0	50.8	52.4	19.2	25.4	112.0	11.6	18.8	38.8	25.8	19.2	90.5	107.6	80.1	70.0
<i>Colaptes cafer collaris</i>	♀	68.8	50.7	53.0	18.3	25.4	112.0	10.7	15.7	39.0	24.6	20.0	92.6	110.1	81.5	70.2
<i>Colaptes auratus luteus</i>	♂	67.4	50.7	52.7	19.3	25.6	106.4	10.3	16.2	38.2	25.1	19.3	90.0	107.0	86.3	69.7
<i>Colaptes auratus luteus</i>	♀	67.8	51.9	53.1	20.3	25.6	109.4	10.6	17.2	38.1	26.1	20.7	90.6	106.8	89.6	70.8

TABLE 3

COMPARISON OF MEAN MEASUREMENTS OF EACH CHARACTER IN EACH SPECIES WITH THOSE OF THE MALE FLICKER

Species	Sex	Length cranium	Width cranium	Width at auditory	Interorbital	Width maxillae	Length ramus	Height ramus	Mandibular symphysis	Length pygoyle	Width pygoyle	Length pygoyle	Length humerus	Length ulna	Length sternum	Length tarsus	Length tibia
<i>Colaptes auratus luteus</i>	♂	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<i>Colaptes auratus luteus</i>	♀	99.7	101.2	100.0	101.0	99.2	101.8	102.1	107.0	102.8	103.5	103.5	99.9	99.0	98.1	100.6	99.1
<i>Colaptes cafer collaris</i>	♂	103.6	104.5	103.4	104.6	104.4	109.8	117.8	121.1	106.0	107.1	102.3	105.4	104.8	96.9	104.5	104.2
<i>Colaptes cafer collaris</i>	♀	103.4	101.2	101.6	99.0	100.9	107.0	115.5	98.6	103.5	99.4	103.5	104.5	104.8	96.0	101.8	101.4
<i>Asyndesmus lewisii</i>	♂ ♀	89.9	97.7	90.5	102.2	96.5	86.5	91.0	146.5	97.0	83.6	89.6	99.4	103.4	88.0	86.9	91.1
<i>Melanerpes erythrocephalus</i>	♂	88.2	91.0	86.5	91.6	96.5	83.5	84.5	156.2	72.5	74.5	74.5	85.4	84.0	73.3	77.7	80.6
<i>Melanerpes erythrocephalus</i>	♀	86.0	89.9	82.6	84.5	93.9	81.7	84.5	156.2	72.5	74.5	73.2	84.4	83.2	72.2	77.1	79.8
<i>Balamosphyra formicivora bairdi</i>	♂	81.5	92.0	81.0	92.9	95.5	85.9	93.4	166.2	87.4	74.5	75.6	89.6	91.4	75.9	78.3	81.7
<i>Balamosphyra formicivora bairdi</i>	♀	87.5	96.5	85.4	97.6	97.3	83.8	93.4	156.3	88.4	66.3	68.6	83.7	85.3	74.6	74.1	79.2
<i>Centurus carolinus</i>	♂	91.5	92.0	82.4	104.6	94.6	89.4	95.6	153.5	85.6	82.6	90.7	83.4	82.8	79.0	76.4	77.5
<i>Centurus carolinus</i>	♀	88.5	88.4	81.5	96.5	90.2	87.7	89.0	136.5	88.0	87.2	92.0	83.7	84.8	76.2	76.4	76.5
<i>Ceophloeus pileatus</i>	♂	122.5	125.5	123.9	166.8	166.0	145.5	209.0	225.3	161.0	157.5	174.5	138.0	139.5	122.5	134.0	123.1
<i>Xenopicus albolarvatus albolarvatus</i>	♂	75.3	88.8	84.4	91.7	90.0	72.7	104.4	145.0	88.6	83.6	97.7	75.0	75.8	69.4	70.2	75.0
<i>Sphyrapicus thyroideus</i>	♂ ♀	62.8	74.5	75.4	88.2	75.9	61.6	73.5	115.6	82.0	79.0	85.0	71.9	74.5	67.2	66.0	70.8
<i>Dryobates pubescens medianus</i>	♂	62.8	73.0	68.4	75.0	66.1	48.7	71.1	73.1	63.0	61.9	68.7	55.8	55.9	51.3	53.2	57.3
<i>Dryobates pubescens medianus</i>	♀	62.1	71.6	67.5	73.9	64.2	44.2	62.1	83.1	62.4	63.6	68.7	55.8	55.9	51.5	52.8	57.3
<i>Dryobates villosus villosus</i>	♂	80.7	92.9	89.4	114.1	92.0	76.5	104.2	151.0	92.3	89.1	103.4	75.2	75.0	71.1	75.5	74.8
<i>Dryobates villosus villosus</i>	♀	79.3	92.4	87.5	116.5	93.9	77.8	104.2	152.1	89.4	86.8	100.0	74.9	74.2	69.9	75.1	75.0
<i>Picoides arcticus</i>	♂ ♀	74.3	100.0	97.0	140.5	116.0	79.4	95.5	124.0	95.9	107.2	112.7	76.2	74.6	76.6	82.0	75.4

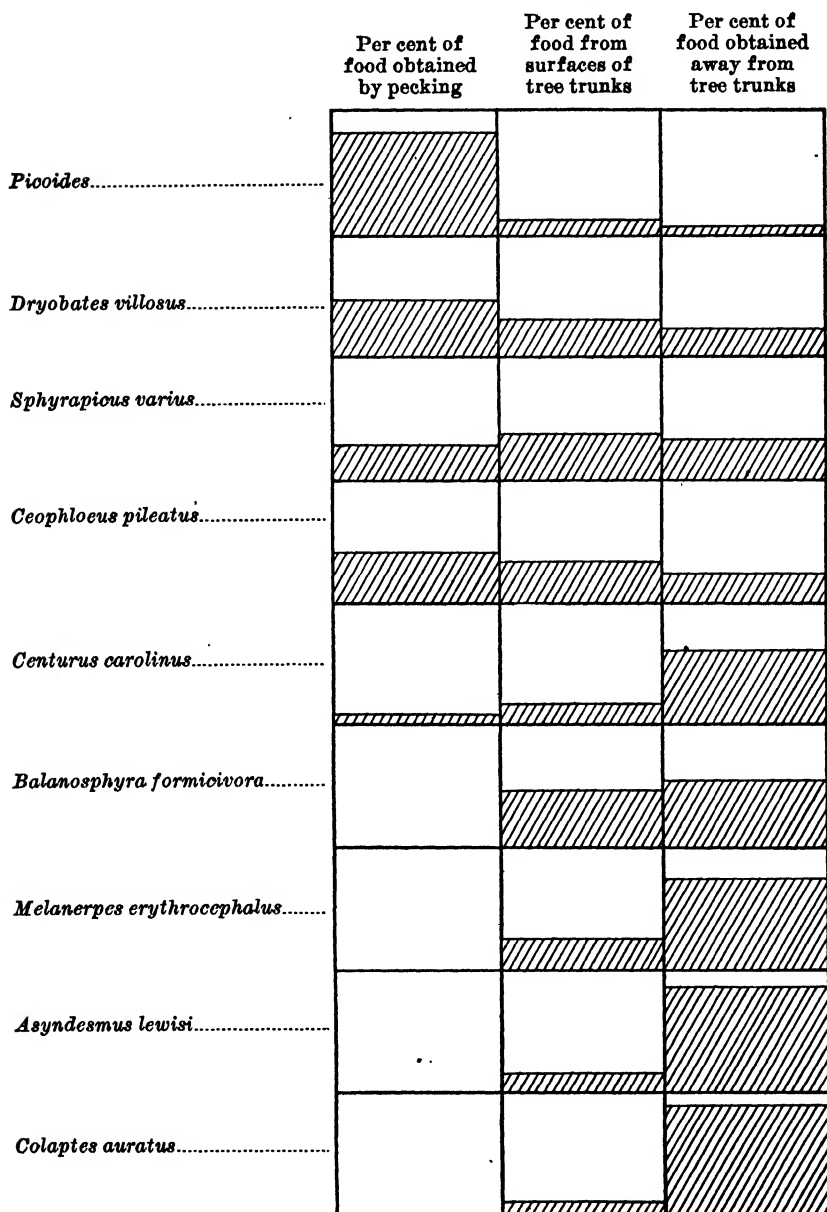


Fig. 1. A diagram showing the foods of nine genera of woodpeckers plotted as to (1) the per cent of food obtained by pecking, (2) the per cent taken from surfaces of tree trunks or poles, and (3) the per cent taken from small branches, the air, or the ground. Each square represents the total amount of food eaten; the shaded areas represent the percentage of food that falls in each vertical column. As one passes from bottom to top the percentage of food, as indicated by the shaded area, increases in the left-hand column and decreases in the right-hand column. The chart is based on data taken from Beal (1911). Compare with figure 2.

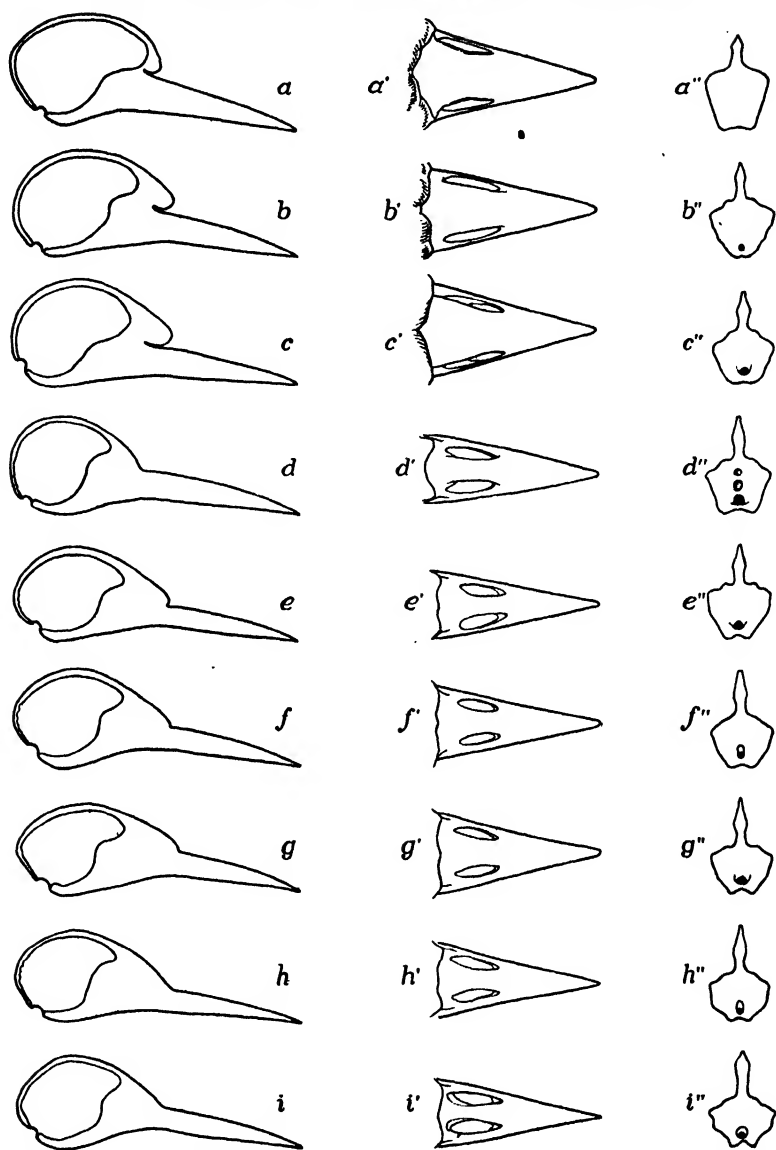


Fig. 2. *a* to *i*, sagittal sections of the skulls of nine genera of woodpeckers arranged in the same order as the genera in figure 1, and all reduced to a common length for comparison. Note, as one passes from bottom to top, the decrease in magnitude of the cranio-facial angle with ultimately a folding under of the frontals, and the relative increase in the size of the brain cavity; *a'* to *i'*, dorsal views of the premaxillae of the same nine genera, all reduced to a common length, showing, as one passes from the bottom to the top of the series, a relative increase in width and a shifting of the narial openings from a dorsal position to a lateral position; *a''* to *i''*, posterior views of the pygostyles of the same nine genera, all reduced to a common length; note, as one passes from the bottom to the top of the series, the relative increase in the size of the disc and the decrease in the length of the spine. Compare with figure 1 and text.

The cranio-facial angle, formed by the meeting of the frontals and the superior processes of the premaxillae, is less obtuse in the woodpeckers than in most other birds. The axis of the upper mandible is peculiarly low and is nearly continuous with the basicranium. In the North American woodpeckers the genera show a gradation in form from those, like the flicker, where the frontals slope down gradually onto the premaxillae, to types, like the three-toed woodpecker, where the frontals are folded under as though the whole beak had been pushed back into the cranium (fig. 2*a*). Along with this apparent *telescoping* of the skull there is a gradual widening of the premaxillae at the bases and a shifting of the narial openings from a dorsal position, near the median line in the flicker, to a lateral position near the edges of the premaxillae in the three-toed woodpecker (fig. 2, *a'* to *i'*). The premaxillae are slightly downcurved in the flicker, grading into straight premaxillae in the three-toed woodpecker, and the long axis of the premaxillae passes through the cranium proper in the flicker whereas it passes along the basicranium in the three-toed woodpecker. The suture between the frontals and the premaxillae is a straight line in the flicker, a half-circle, with the open portion directed anteriorly, in the three-toed woodpecker. The interorbital septum is thin in the flicker, shortened antero-posteriorly and thick in the three-toed woodpecker. The brain case is relatively long and narrow in the flicker, proportionately wider and more expansive in the three-toed woodpecker (see figs. 2 and 3 and table 2 for comparative skull proportions).

These are the most outstanding differences, in skull proportions, between the flicker, which stands at one extreme, and the three-toed woodpecker, which stands at the other extreme of specialization. Intermediate stages are to be found in the other genera of woodpeckers (compare drawings, fig. 2).

What is the significance of these differences in amount of modification in the skulls of the different genera? In the accompanying chart (fig. 1) the food habits of nine genera of North American woodpeckers are plotted as to (1) percentage of food that requires pecking, (2) percentage of food obtained from surfaces of tree trunks or poles, but requiring no pecking, and (3) percentage of food taken away from upright tree trunks or poles and requiring no pecking. The genera are arranged, from the bottom to the top of the chart, so that in the right-hand column they are in the order of decreasing percentages of food taken entirely away from tree trunks or poles;

in the left-hand column they are in the order of increasing percentages of food taken from tree trunks and requiring pecking. This serves as an index to the relative amount of time spent, by members of each genus, on tree trunks and to the amount of time spent in pecking while on the tree trunks. The chart is based on data taken from Beal (1911) and summarized earlier in the present paper. The

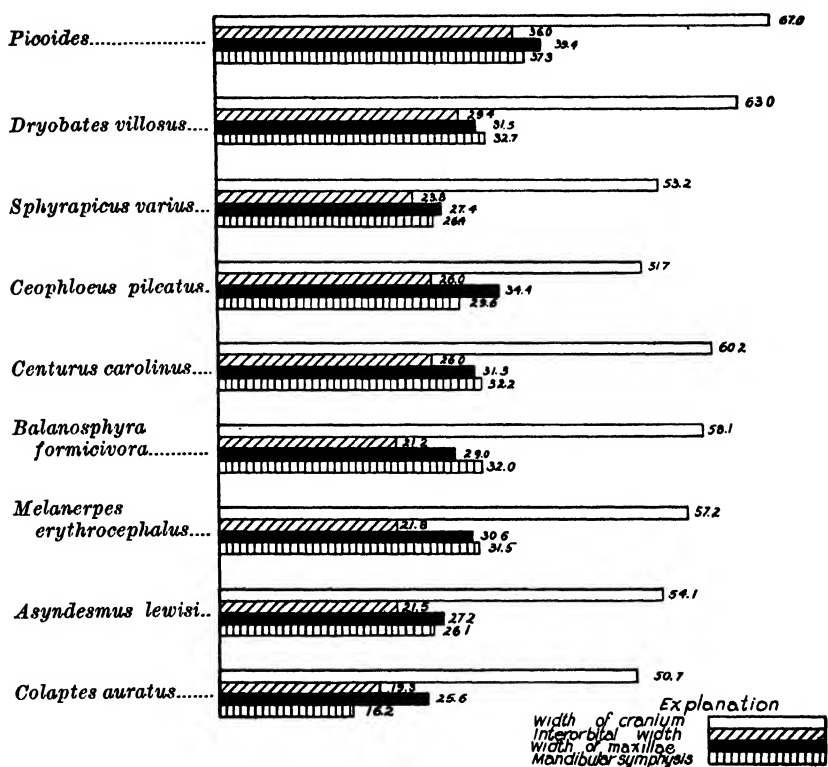


Fig. 3. A diagram showing the relative percentage values for four skeletal characters, as compared with the measurement, length of tibiotarsus, in nine genera of woodpeckers. The diagram is based on table 2 and the percentage value for each character is given at the end of the line representing that character.

chart is subject to error owing to the fact that it was not always possible to tell just where the bird obtained a certain kind of insect. The error would be slight as concerns wood-boring larvae; but whether certain of the other groups were taken from surfaces of tree trunks or from the ground is not always possible to determine. There is a possible error of from 5 to 10 per cent in these last two groups, but even that would not appreciably affect the reliability of the chart.

The pileated woodpecker (*Ceophloeus*) is placed, in the chart, below the sapsucker (*Sphyrapicus*), although, according to data at hand, the percentage of its food requiring pecking is greater than in the case of the sapsucker. This arrangement seemed advisable because of the fact that the pileated woodpecker gets much of its food from decaying logs which are soft and easily pulled to pieces, whereas the sapsucker usually works on living trees and probably does more pecking into hard wood than does the pileated woodpecker. The two genera, *Xenopicus* and *Campcophilus* are not included in the chart (fig. 1) nor in the drawings (fig. 2) because of insufficiency of material and data on food habits. They would fall, I think, close to *Dryobates*, were they included.

The drawings of sagittal sections of the skulls (fig. 2) are intended to show the decrease in curvature of the premaxillae and the decrease in magnitude of the cranio-facial angle with ultimately a folding under of the frontals as one passes from the bottom to the top of the series; the relative increase in size of the brain cavity should also be noted. The drawings are arranged in the same order as the genera in the chart (fig. 1). The dorsal views of the premaxillae are intended to show the relative increase in width, as compared with length, and the shifting of the narial openings, from near the mid-line, laterally, to a position near the outer borders as one passes from the bottom to the top of the series.

For sake of comparison, the drawings of the skulls (fig. 2, *a* to *i*) have all been reduced to a common length; this measurement was taken from the tip of the premaxillae to the back of the cranium. In a similar way the drawings of the premaxillae (fig. 2, *a'* to *i'*) have been reduced to a common length for better comparison of proportions.

A comparative study of the chart (fig. 1) and the drawings (fig. 2) will reveal, the writer believes, a positive correlation between the method of obtaining food and the type of structure found in the skull. In other words, it is here held that there is a direct correlation between structure and function. If one is given a skull of a woodpecker he can predict, with a fair degree of certainty, the type of food eaten by that bird; and in a similar way, if given sufficient data on the food habits of a given woodpecker one can predict almost certainly the general type of skull possessed by that bird. The birds which have the skull most modified in pertinent respects do the greatest amount of pecking.

All the modifications mentioned above seem to point toward a stronger skull in those forms which use this organ for digging into bark and wood. The greater strength and rigidity of the skull make for a more effective tool for excavating. It is obvious, from the standpoint of mechanics, that a straight tool without give or spring is more effective as a drill than is a curved tool with more or less spring to it. In turn the straight beak must, of necessity, have a stronger, firmer support by the cranium proper if it is to be more effective. To provide for this, the base of the beak is proportionately wider and the median portions of the superior processes of the premaxillae extend farther posteriorly than do the lateral portions, thereby forming, at their attachment with the cranium, a curved suture (fig. 2, *a'*) which is concave anteriorly. This type of connection not only allows for a more uniform distribution of pressure of beak against cranium, but also prevents the upward and downward movement of beak with respect to cranium as is possible where the suture is a straight line such as in *Colaptes*. It is self-evident that for freest movement a hinge must be straight.

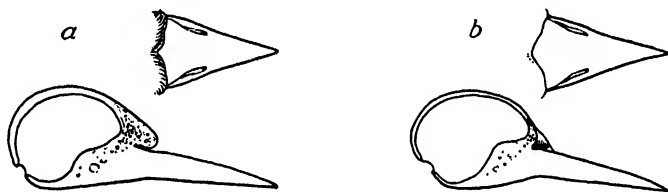


Fig. 4. *Sphyrapicus varius*; *a*, dorsal view of premaxillae and sagittal section of skull, $\times 1$, showing the folded under condition of the frontals on the premaxillae in an adult bird; *b*, the same views of a young individual not yet covered with feathers, $\times 1$, showing apparently as much of the telescoped condition, but lacking the growth of cancellous bone that overlaps, in the middle, the superior processes of the premaxillae.

The question now arises as to whether the condition found in the three-toed woodpecker is a result of more prolonged and vigorous impact caused by the greater amount of pecking within the lifetime of the individual, or a result of natural selection through inherited variations. The first alternative, if true, would be a case of *telescoping* of the skull similar to that described in the cetacean skull by G. S. Miller (1923). If this were the case in the woodpecker we should expect to find at least the final stages of remodeling taking place after the young bird begins its pecking career. But this is not so; nestlings of the sapsucker not yet covered with feathers show the so-called telescoping of the skull as well developed as do the adult birds (fig. 4). However, as shown in figure 4, the young skull is not

yet reinforced to the extent found in the adult skull. The part of the frontals that folds down over the premaxillae in the adult is just beginning to be formed in the young individual figured, therefore, in the sagittal section of the skull, the apparent telescoping is not so conspicuous in the young individual. If we look at a dorsal view of the premaxillae we see the curved suture extending back into the cranium proper relatively as far as it does in the adult. It therefore does not seem plausible to explain this condition by assuming that there has been a certain amount of pressure applied at either extremity of the skull and that the intermittent bones have been telescoped during the lifetime of the individual.

The second alternative would imply that the modification of structure found in the three-toed woodpecker would fit the race better to survive under the more arboreal conditions, in other words would be of significant survival value for forest living, and through natural selection races would be developed to fill the niches not occupied by less arboreal types such as the flicker. This would not necessarily imply that these races would be more successful than other races. If success of a race be measured by numbers of individuals per unit of area (Ritter, 1929), then the three-toed woodpecker would probably be less successful than some of the other genera; but again it does not seem logical to measure success by merely the number of individuals in a given genus.

Whatever be the case in the skull of the woodpecker or in the cetacean (G. S. Miller, 1923), it has been shown by Koch (1917), J. A. Howell (1917), and others that stresses and strains do have a considerable effect on the growth of bones. Howell (*loc. cit.*) studied the effects of stress and strain on bone growth in dogs by cutting the main nerves of the brachial plexus on the right side in order to produce paralysis of the muscles. He showed that the growth in length of the bones on the paralyzed side was almost as rapid as it was on the normal side. However, the diameter of the bones on the paralyzed side increased slightly at first, then decreased to slightly below what the diameter was at the beginning of the experiment and remained stationary throughout the rest of the experiment. Howell concludes that the growth of bone is regulated in part by action of the mechanical factors of stress and strain, and in part by other factors, whatever these "other factors" may be.

According to the above experiment, if the mechanical factors of stress and strain on the bone are altered, we should expect marked

alterations in diameter of bone, but very little if any in the longitudinal growth. Instead of causing the bones to become shorter or smaller in any way, the mechanical factors cause them to become longer, thicker, and stronger. Inasmuch as the experiment just alluded to was based on bones of mammals, it is necessary in the present comparison with conditions found in bird bones to infer that the reaction of bones to stimulation of pressure is similar in the two groups of animals.

In the woodpecker skull there is little if any determinable evidence to lead one to suspect that the telescoped condition found in the three-toed woodpecker is due in any way to the greater amount of pecking in the lifetime of the individual. On the other hand it seems more logical, although again there is little direct evidence to prove it, that the bird pecks more during its lifetime because it is better fitted to do so—because, plus the pecking instinct, it has the structural equipment.

The incipient stages in the development of the type of skull found in the three-toed woodpecker could hardly be considered as having survival value. It seems logical, however, to think of certain new characters as being linked with other characters which in themselves may or may not have survival value. If these other characters do have survival value, that is, are not detrimental to the race, and the new characters brought about by inherited variations are linked with them, it makes it possible for the new characters to develop to a stage where they too will have survival value. Once this stage is reached, natural selection, in most cases, can well account for the present condition.

As has been noted above, the skull is peculiarly modified, presumably to make it a more efficient tool with which to excavate nest holes and insects from wood and bark. Similarly the tail of the woodpecker, serving as a brace or prop at the other end of the bird and thereby making the pecking action more effective, has been adaptively modified to meet these arboreal conditions, adaptations such as are found in but few other birds.

The skeleton of the tail is made up of from five to seven free caudal vertebrae plus the terminal pygostyle or plowshare bone. The number of free caudals varies with age and the amount of fusion that has taken place. In the younger specimens the number of free vertebrae is naturally greater than in mature individuals. The pygostyle is formed by the fusion of the terminal segments, six in the case of

Colaptes auratus luteus, and it has a well developed terminal disc. The broad, well developed terminal disc is characteristic of the Picidae.

The free caudals are relatively little modified except for their well developed transverse processes, neural spines, and chevron bones. The latter are fused to the ventral surfaces of the centra. It is in the pygostyle, however, that the greatest modification occurs, this being the portion where not only the strong rectrices are inserted, but where the main muscle attachments of this region are made. The pygostyle runs a gamut of variations in size and outline in the Picidae, but is fairly constant for each genus within that family so far as studied by the writer. The pygostyle is proportionately larger and better developed in the more arboreal forms—*Picoides*, *Dryobates*, and *Sphyrapicus*, whereas it is less developed in the less arboreal forms—*Colaptes*, *Melanerpes*, and *Asyndesmus* (fig. 2, *a''* to *i''*; fig. 5). In the last three genera the tail is used for a prop relatively less than it is in the first three.

The pygostyle, as well as the skull, can be directly correlated, in most cases, with the habits of the birds. In the drawings of the pygostyles of the different genera (fig. 2, *a''* to *i''*) we can see, as we pass from the bottom to the top of the series, a progressive increase in the size of the disc or enlarged plate-like portion, and a progressive decrease in the relative length of the neural spine. A comparison of this series with the chart (fig. 1) will show that, as we pass from the less arboreal types at the bottom of the series to the more arboreal types at the top, we get a progressive increase in size of the disc. Here then, as in the skull, we have a positive correlation of structure and function. We should expect the greatest modification in the disc, since it is to this part of the pygostyle that the principal tail muscles are attached. In the drawings the pygostyles have all been reduced to a common length so as better to compare the relative proportions in the genera represented.

The skeletal elements, other than the skull and pygostyle, do not show, to any extent, different degrees of modification in the different genera. The wing bones vary somewhat in relative lengths in the different genera (see table 2). The ulna is relatively longer in the sapsucker, California woodpecker, and Lewis woodpecker; it is relatively shorter in the three-toed woodpecker, hairy woodpecker, and flicker (fig. 5). The longer wing in the sapsucker may be accounted for, in part, by the fact that members of this genus of birds are more

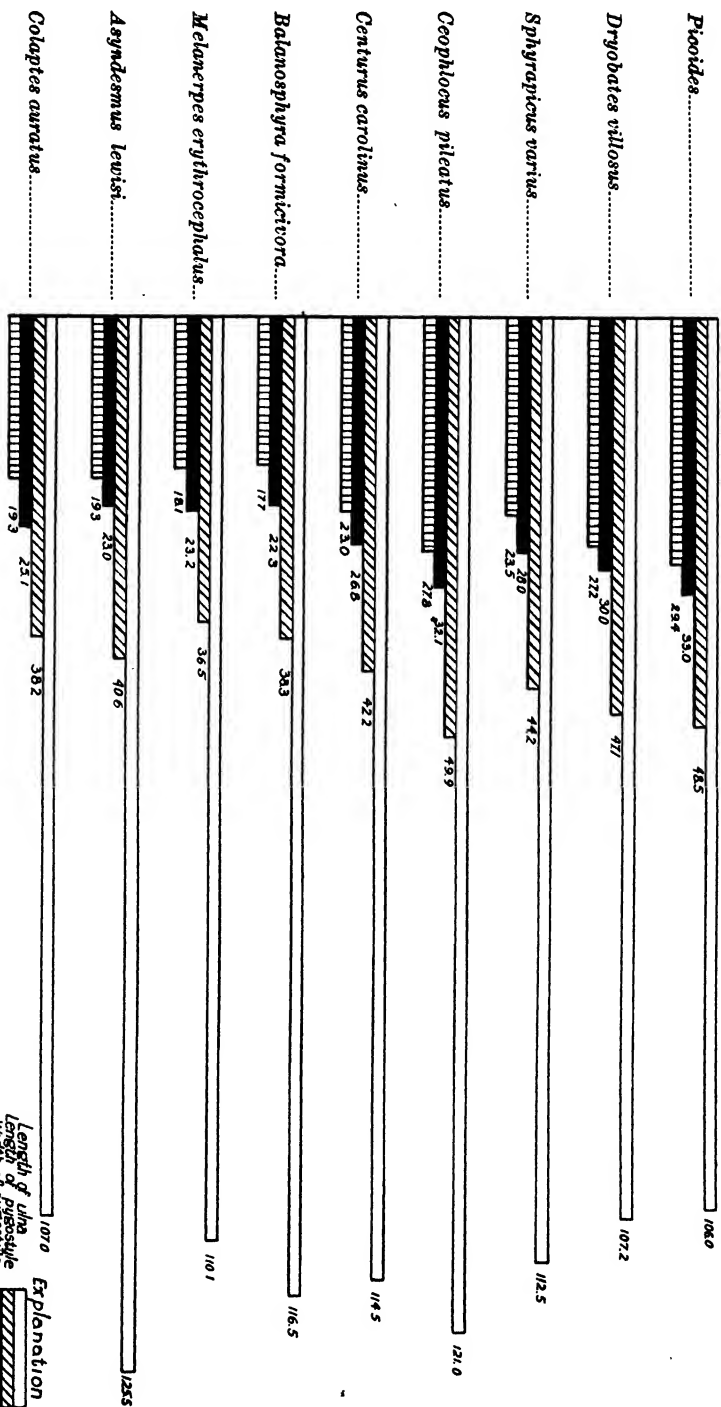


Fig. 5. A diagram showing the relative percentage values for four skeletal characters, as compared with the measurement length of tibiotarsus, in nine genera of woodpeckers. The diagram is based on table 2 and the percentage value for each character is given at the end of the line representing that character.

migratory than are the other woodpeckers. The California woodpecker does a considerable amount of flying in its daily routine, fly catching, carrying acorns, or merely going from one tree to the other. The Lewis woodpecker also spends, relatively, a considerable amount of time on the wing. On the other hand, the three-toed woodpecker and the hairy woodpecker confine their activities more to the tree trunks, while the flicker spends much time on the ground. If sufficient data on the average daily distances of flight for each genus were at hand one would probably be able to correlate the average daily distance of flight with length of wing.

MYOLOGY

The following muscle descriptions are based on the dissection of two adult specimens of the pileated woodpecker (*Ceophloeus pileatus*). Partial dissections of members of the other available genera were made for comparison of certain of the muscles. The terminology of the muscles is based primarily on Shufeldt (1890); Gadow (1891) and Fürbringer (1902) were also used as references. An attempt was made to follow Emmel's (1927) B N A as closely as possible, although this is based on mammalian musculature.

The innervations of the muscles are not included in the present paper. Gadow (*loc. cit.*) and Fürbringer (*loc. cit.*) give the innervations and homologies of the bird muscles as far as known.

In the following descriptions the muscles are grouped according to regions of the body. These groups are as follows: dermal muscles, muscles of the upper extremity, muscles of the lower extremity, muscles of the tongue and air passages, muscles of the head and trunk, muscles of the tail.

DERMAL MUSCLES

M. dermofrontalis—

Origin.—On the frontal bone above and along the supraorbital crest, then forward over the forehead where it meets, in the center about halfway down the forehead, the muscle mass from the other side.

Insertion.—At the bases of the feathers of the forehead.

Remarks.—The fibers lie in an antero-lateral position and when they contract they cause the feathers of the forehead to be raised. I have observed a live red-breasted sapsucker, in captivity, raise the feathers on the entire forehead by contraction of these muscles.

M. dermatemporalis—

Origin.—From a small area posterior and dorsal to the ear opening. The area is obliquely situated on the lateral border of the back of the skull (figs. 27 and 28).

Insertion.—Onto the skin over most of the lateral and ventral surfaces of the neck.

Remarks.—From the point of origin, this muscle spreads out fan-shaped over the skin of the neck. The fibers from the two sides converge in the mid-ventral line of the neck region. The origin of this muscle is somewhat variable in the different genera of the woodpeckers dissected. In *Sphyrapicus*, *Melanerpes*, *Balanosphyra*, and *Centurus* it arises just above and anterior to the temporal fossa. This origin is somewhat anterior to that just described for *Ceophloeus*. *Colaptes* is similar to *Ceophloeus* in this respect. In *Dryobates* and *Xenopicus* the points of origin are found above the ear opening somewhat intermediate, in position, to the extremes.

M. dermodorsalis —

This muscle is made up of a series of small fasciculi with their origins on the skin and their insertions on the butts of the feathers just anterior to the points of origin. Contraction elevates the feathers of the back. The *M. dermo-iliacus*, in its contraction, counteracts this and causes the feathers to lie flat on the back by stretching the skin over that region.

M. platysma myoides—

Origin.—By a thin tendinous sheath along the inner margin of the mandible near the inner articular process (fig. 27), and from the lateral border of the basitemporal plate posterior to the quadrate bone.

Insertion.—By a thin raphe, in the mid-ventral line where the muscles from the two sides come together.

Remarks.—This is a very thin sheet of muscle lying close to the skin. It aids in supporting the lingual apparatus. Posteriorly this muscle sends a branch up either side of the neck and the fibers fuse in part with those of the *M. dermatemporalis*.

M. dermatensor patagii—

Origin.—From the *M. tensor patagii longus* near the shoulder (figs. 6 and 10).

Insertion.—Partly into the skin of the lateral part of the neck, and partly into the fibers of the *M. dermatemporalis*.

Remarks.—This is a small but well defined muscle occupying, at its median portion, the triangular fold of skin termed *parapatagium* by Shufeldt (1890, p. 7).

M. dermocleidodorsalis—

Origin.—From a small area on the inner side of the furcula just above the origin of the *M. cleidotrachealis*.

Insertion.—Into the skin over the anterior portion of the back.

Remarks.—This is a very thin slip of muscle. It passes back over the shoulder joint and spreads out on the skin of the dorsal region.

M. cleidotrachealis—

Origin.—From a small area on the inner side of each branch of the furcula.

Insertion.—By a few fibers into the skin about one-fourth the distance up the neck, and separately at a point lateral to the superior larynx (fig. 25).

Remarks.—From its point of attachment to the skin each muscle passes to the trachea, follows ventro-lateral to this, passes across the *M. tracheolateralis*, then to its point of insertion.

M. dermo-iliacus—

Origin.—From the fascia covering the antero-lateral margin of the ilium.

Insertion.—Onto the skin along the outer edge of the spinal feather tract and over the shoulder region.

Remarks.—This thin slip of muscle extends up along the back near the spinal feather tract then spreads out slightly over the shoulder region to be lost near the shoulder joint.

M. dermo-ulnaris—

Origin.—From the external surface of the second rib from the front (with uncinat process), just above its uncinat process.

Insertion.—Onto the skin beneath the humeral feather tract and in the fascia covering the elbow.

Remarks.—After its attachment to the skin the muscle becomes tendinous; the small tendon lies within the posterior part of the fold of skin along the posterior border of the humerus. Near the elbow the tendon inserts into the dense fascia that covers the joint.

M. dermo-humeralis—

Origin.—From a small area on the under side of the pectoral crest of the humerus just distal to the origin of the *M. pectoralis major* (fig. 12, a).

Insertion.—On the skin under the axillar region of the ventral feather tract.

M. dermopectoralis—

This muscle, made up of a series of small fasciculi, lies close to the skin along the under side of the axillar region of the ventral feather tract. Each fasciculus has its origin on the skin and its insertion on the butt of a feather quill just anterior to the origin. Contraction elevates the feathers of the breast.

MUSCLES OF THE UPPER EXTREMITY

M. pectoralis major—

Origin.—Fleshy, from the ventral half of the keel of the sternum, most of the posterior half of the flattened sternum, and most of the outer border of the furcula (figs. 6, 7, and 8).

Insertion.—Tendinous, by a broad heavy tendon on the palmar side of the deltoid crest of the humerus and by a small tendon on the distal end of the coracoid (figs. 9, a and 12, a).

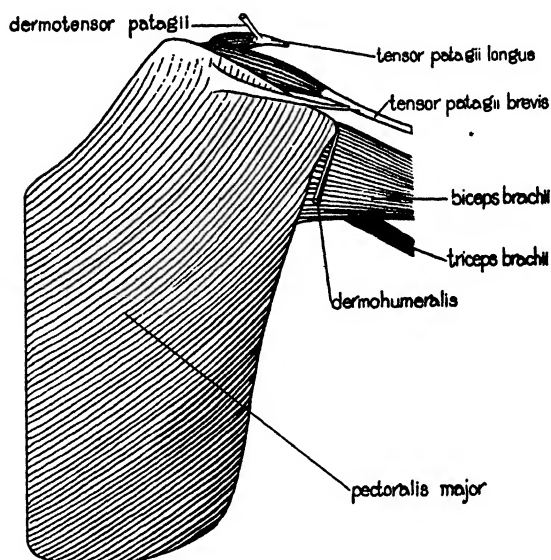


Fig. 6. *Ceophloeus pileatus picinus*; ventral view of pectoral region, $\times 1$, showing superficial muscles. Mus. Vert. Zool. no. 54253.

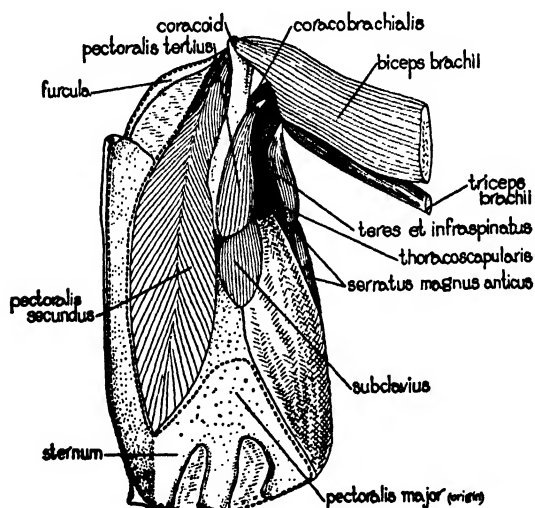


Fig. 7. *Ceophloeus pileatus picinus*; ventral view of pectoral region, $\times 1$, showing the deep muscles exposed by removing the large *M. pectoralis major*. Mus. Vert. Zool. no. 54253.

Remarks.—The muscle fibers converge and become tendinous over the shoulder region. A tendinous slip passes from the shoulder region, near the insertion on the humerus, nearly parallel to the humerus and joins the tendon of the *M. tensor patagii brevis* about half way down the upper arm. The tendon of the *M. dermohumeralis* does not fuse with the tendon of the *M. pectoralis major*, but inserts separately on the distal portion of the pectoral crest. The *M. pectoralis major*, upon contracting, pulls the humerus ventrally and at the same time rotates it inward, effecting a much greater downward thrust of the distal portion of the wing than if there was no rotation.

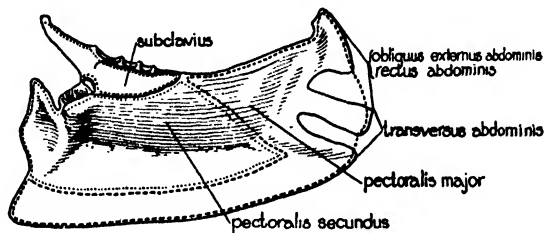


Fig. 8. *Ceophloeus pileatus picinus*; lateral view of sternum, $\times 1$, showing areas of muscle attachments. Mus. Vert. Zool. no. 31301.

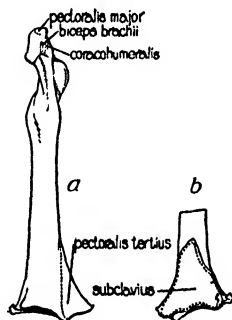


Fig. 9. *Ceophloeus pileatus picinus*; a, anterior view of coracoid, $\times 1$, showing areas of muscle attachments; b, posterior view of the proximal end of the coracoid, $\times 1$, showing area for attachment of the *M. subclavius*. Mus. Vert. Zool. no. 31301.

M. pectoralis secundus—

Origin.—From the remainder of the keel of the sternum not taken up by the *M. pectoralis major*, from the anterior portion of the body of the sternum, the sternal part of the coracoid, extending along the inner ventral margin nearly halfway, and from the tendinous membrane stretched in the space between the furcula, sternum, and coracoid (figs. 7 and 8).

Insertion.—By a strong tendon on the deltoid crest proximal to the limits of the insertion of the *M. pectoralis major* on that crest (fig. 12, a).

Remarks.—The fibers of this muscle converge into a strong round tendon which passes through the canal formed by the union of the

coracoid, furcula, and scapula. After passing through the canal, which serves as a pulley for this tendon, the tendon is directed downward to its point of insertion on the humerus. The muscle serves as a levator of the wing and at the same time rotates the humerus in the opposite direction to the rotation produced by the *M. pectoralis major*.

M. pectoralis tertius—

Origin.—With fascia from the subclavius muscle underlying it and fleshy from the outer border of the proximal one-fourth of the coracoid (figs. 7 and 9, a).

Insertion.—By a strong tendon, on the internal tuberosity of the head of the humerus, at the edge of the pneumatic fossa (fig. 12, b).

Remarks.—In the woodpecker this muscle does not have an attachment to the sternum as it does in the raven (Shufeldt, 1890, p. 75). Some of the fibers fuse, dorsal to the coracoid, with those of the subclavius muscle. Contraction pulls the humerus downward; this is the opposite of the action effected by the *M. pectoralis secundus*.

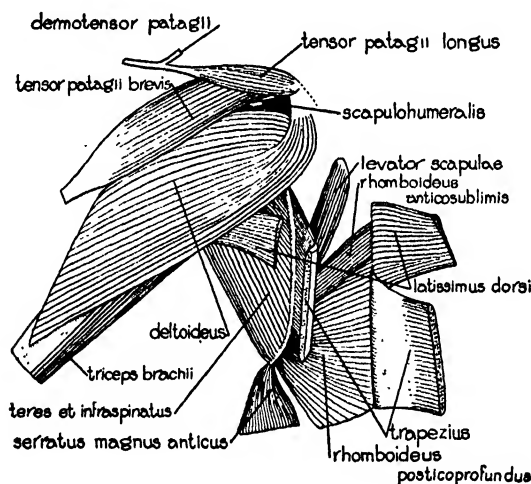


Fig. 10. *Ceophloeus pileatus ptoinus*; dorsal view of the superficial muscles of the shoulder region, $\times 1$, the *M. latissimus dorsi* and *M. trapezius* are turned back so as to expose the underlying *M. rhomboideus*. Mus. Vert. Zool. no. 54253.

M. latissimus dorsi—

Origin.—From the neural spines of the first three rib-bearing vertebrae (fig. 10).

Insertion.—Partly tendinous, on the anconal aspect of the shaft of the humerus, just distal to the termination of the deltoid crest (figs. 11 and 12, b).

Remarks.—This is a thin ribbon-like muscle which tapers gradually for a short distance from the line of origin, then continues as a straight muscle to its insertion on the humerus. In the woodpecker it is a single muscle.

M. trapezius—

Origin.—From the neural spines of the second, third, and fourth rib-bearing vertebrae (fig. 10).

Insertion.—Along the angle of the dorsal aspect of the scapula, from the point where the distal end curves ventrally to the point where the proximal end begins to expand (fig. 13, b).

Remarks.—The anterior portion of this muscle underlies the *M. latissimus dorsi*; the posterior portion is superficial. From the line of origin, the fibers slant anteriorly and laterally to the line of insertion on the scapula.

M. rhomboideus anticosublimis—

Origin.—From the neural spines of the first and second rib-bearing vertebrae, beneath the origin of the *M. latissimus dorsi* (fig. 10).

Insertion.—Near the distal end of the scapula, on the superior crest, just beneath the insertion of the posterior part of the *M. trapezius* (fig. 13, b).

Remarks.—This narrow ribbon of muscle fibers lies underneath the *M. latissimus dorsi* at the point of origin and under the *M. trapezius* at the point of insertion. Contraction would pull the scapula forward, upward, and inward.

M. rhomboideus posticoprofundus—

Origin.—From the neural spines of the first five rib-bearing vertebrae, beneath the origins of the *M. latissimus dorsi* and the *M. trapezius* (fig. 10).

Insertion.—On the inner aspect of the distal end of the scapula (fig. 13, b).

Remarks.—The fibers of this large fan-shaped muscle converge from their point of origin to insert in the small depression at the distal end of the scapula. A small slip is given off from the anterior edge near the origin of the muscle. The slip passes just posterior to the *M. rhomboideus anticosublimis*, lies close to the main muscle mass of the *M. rhomboideus posticoprofundus*, and inserts on the inner side of the scapula a short distance above the insertion of the main muscle. The *M. rhomboideus*, according to Shufeldt (1890, p. 85), is invariably a single muscle in birds, mostly a double muscle in mammals. Fürbringer (1902) gives two and sometimes three divisions of this muscle in certain birds. There is clearly a double muscle in the pileated woodpecker with a small third slip. However, the third slip that is given off is a very small one and is of little concern.

M. coracohumeralis—

Origin.—Tendinous, on the outer side of the head of the coracoid, above the insertion of the long head of the *M. biceps brachii* (fig. 9, a).

Insertion.—On the palmar side of the head of the humerus, as a broad band of fibers, just proximal to, and to the inner side of, the insertions of the *M. pectoralis major* (fig. 12, a).

Remarks.—This is a short triangular muscle in the woodpecker; the fibers converge rapidly from the origin on the humerus to be inserted by a tendon on the coracoid.

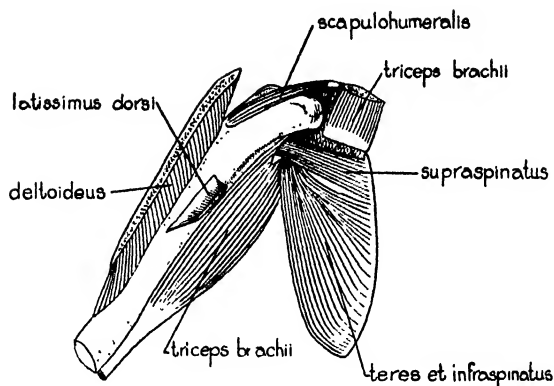


Fig. 11. *Ceophloeus pileatus picinus*; dorsal view of the deep muscles of the shoulder region, $\times 1$, the *M. deltoideus* and the *M. triceps brachii*, scapular head, have been turned back so as better to expose the underlying muscles. Mus. Vert. Zool. no. 54253.

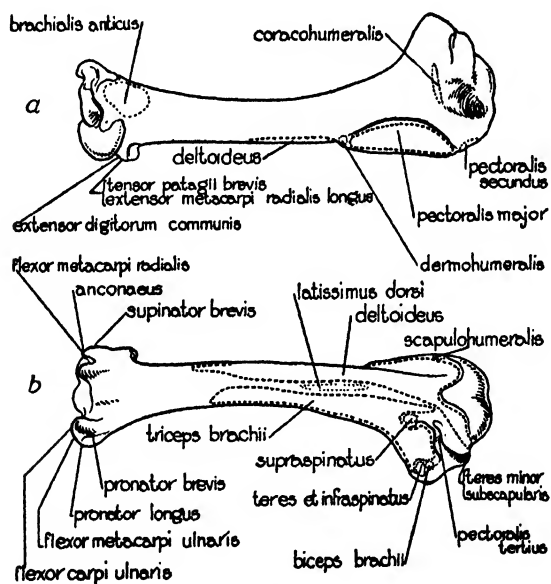


Fig. 12. *Ceophloeus pileatus picinus*; a, palmar view of humerus, $\times 1$; b, anconal view of same, $\times 1$, showing areas for muscle attachments. Mus. Vert. Zool. no. 31301.

M. scapulohumeralis—

Origin.—Tendinous, on the upper surface of the acromion of the scapula, in close proximity to the attachment of the short head of the *M. deltoideus* (figs. 10, 11, and 13, b).

Insertion.—On the deltoid crest of the humerus external to and near the proximal extremity of the insertion of the *M. deltoideus* (fig. 12, b).

Remarks.—This small straight muscle lies deepest of the muscles of this region; its contraction pulls the humerus forward and upward.

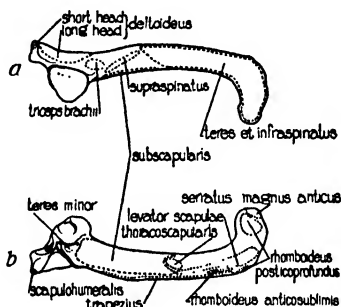


Fig. 13. *Ceophloeus pileatus picinus*; a, outer view, and b, inner view of scapula, $\times 1$, showing areas for muscle attachments. Mus. Vert. Zool. no. 15680.

M. supraspinatus—

Origin.—Along an oblique line on the outer surface of the proximal one-third of the blade of the scapula (figs. 11 and 13, a).

Insertion.—On the anconal aspect of the humerus, near the distal border of the pneumatic fossa, and between the two branches of the *M. triceps brachii* (fig. 12, b).

Remarks.—This is a thin slip of muscle which tapers slightly from its origin, where it is a flat ribbon, to its insertion, where it is a more rounded bundle of fibers; it passes between the two branches of the *M. triceps brachii*.

M. teres et infraspinatus—

Origin.—From the superior margin and the outer surface of the posterior two-thirds of the blade of the scapula (figs. 7, 11, and 13, a).

Insertion.—On the ulnar margin of the pneumatic fossa of the humerus just proximal to the external head of the *M. triceps brachii* (fig. 12, b).

Remarks.—This is a short thick muscle; the fibers converge rapidly from their scapular origin to the point of insertion. Contraction pulls the humerus against the body.

M. serratus magnus anticus—

Origin.—By three heads; the first one from the second true dorsal rib, just above the origin of the *M. dermo-ulnaris*, the second from the third dorsal rib just above its uncinate process, and the third, more extensive, from the lower half of the fourth dorsal rib (fig. 7).

Insertion.—On the inferior surface of the apex of the scapula (fig. 13, b).

Remarks.—This muscle is quite large and has three origins, but the fibers converge into a common tendinous insertion. Contraction pulls the scapula posteriorly.

M. subclavius—

Origin.—From the entire outer ventral surface of the costal process of the sternum and from a portion of the anterior inner surface (figs. 7 and 8).

Insertion.—In the entire fossa on the posterior one-third of the coracoid and also on the end of the process external to the articulation with the sternum (fig. 9, b).

Remarks.—This short muscle underlies the *M. pectoralis tertius* in part and the *M. pectoralis major* in part. Some of the fibers fuse with those of the *M. pectoralis tertius*.

M. coracobrachialis—

Origin.—By delicate fascia from the dorsal surface of the shaft of the coracoid just above the limits of the *M. subclavius*.

Insertion.—By delicate fascia to the tendon of the *M. teres minor*.

Remarks.—This is a very delicate muscle in the woodpecker and is of little importance. The origin and insertion are not by strong tendons but are by delicate fascia; in this group of birds this muscle has the appearance of becoming lost.

M. teres minor—

Origin.—Fleshy, from the ventral surface of the neck and the clavicular process of the scapula (fig. 13, b).

Insertion.—Tendinous, on the internal tuberosity of the head of the humerus, near its proximal border (fig. 12, b).

Remarks.—From its origin, this short muscle passes through the angle of the scapula and the coracoid to its point of insertion on the humerus. Contraction of this muscle effects almost the same motion of the humerus as does contraction of the *M. pectoralis major*.

M. levator scapulae—

Origin.—Fleshy, by three digitations, from the lateral processes of the first three vertebrae anterior to those bearing ribs (fig. 10).

Insertion.—Along the inner dorsal edge of the distal one-third of the shaft of the scapula (fig. 13, b).

M. thoracoscapularis—

Origin.—By one head from the outer surface of the distal end of the most anterior rib possessing an uncinate process.

Insertion.—On the lower inner surface of the center of the scapular blade (fig. 13, b).

Remarks.—This is a much smaller muscle than that described for the raven by Shufeldt (1890, pp. 99–101), and instead of arising by

three digitations it arises by a single head. It is a flat ribbon-like muscle that becomes wider as it passes toward its point of insertion on the scapula. As it nears the scapula it passes between the two divisions of the *M. subscapularis*.

M. subscapularis—

Origin.—Fleshy, from the inner and ventral surfaces of the anterior half of the blade of the scapula (fig. 13).

Insertion.—By a strong tendon, on the internal tuberosity of the humerus in common with the tendon of the *M. teres minor* (fig. 12, *b*).

Remarks.—This muscle divides for a short distance near its distal portion to allow for the passage of the *M. thoracoscapularis*.

M. tensor patagii longus—

Origin.—Tendinous, on the upper and inner margin of the scapular tuberosity of the furcula, 2 mm. back of the anterior point of the tuberosity (fig. 10).

Insertion.—By three small tendons; one ends in heavy tendinous tissue that attaches to the distal end of the radius and to the scapholunar, the other divides and a branch passes to either side of the proximal end of the first digit where it attaches (figs. 14 and 15).

Remarks.—This small slip of muscle has its origin separate from, but in close proximity to, the *M. tensor patagii brevis*. It soon becomes tendinous, receives a tendinous slip from the *M. pectoralis major*, then the tendon of the *M. dermatensor patagii*, and continues along the anterior margin of the triangular patagium.

The insertion is different from that found in the raven by Shufeldt (1890, p. 115) in that the tendon divides shortly before reaching the point of insertion and a branch passes over the scapholunar to divide again and attach to either side of the pollical digit, a condition similar to that found in the hawks and owls by Shufeldt.

M. tensor patagii brevis—

Origin.—Tendinous, from the anterior portion of the scapular tuberosity of the furcula (fig. 10).

Insertion.—Tendinous, in common with the *M. extensor metacarpi radialis longus*, on the ectepicondylar prominence of the humerus (figs. 12, 14, and 15).

Remarks.—This muscle is much larger than the other tensor muscle, which it partly underlies. It passes parallel to the humerus and its tendon meets the *M. extensor metacarpi radialis longus* 10 mm. from the shaft of the humerus. At its union with the latter muscle the tendon bifurcates. The portion passing distally is immediately buried in the muscle, but the other branch passes along the edge of the muscle to the point of insertion.

M. biceps brachii—

Origin.—Tendinous, by two heads; the long head has its origin on the outer aspect of the head of the coracoid distal to the glenoid facet, the short head has its origin on the ulnar edge of the pneumatic fossa

of the humerus proximal to, but nearly joining, that of the *M. teres et infraspinatus* (figs. 6, 7, 9, and 12, b).

Insertion.—By a strong tendon to the small oblique ridge on the palmar aspect of the proximal end of the ulna. The point of attachment is just distal to the articular cavities for the condyles on the distal end of the humerus. It also inserts by a strong tendon to the head of the radius (figs. 15 and 16, b).

Remarks.—This muscle converges rapidly from its belly to its insertion on the radius and ulna. It is the main flexor of the forearm.

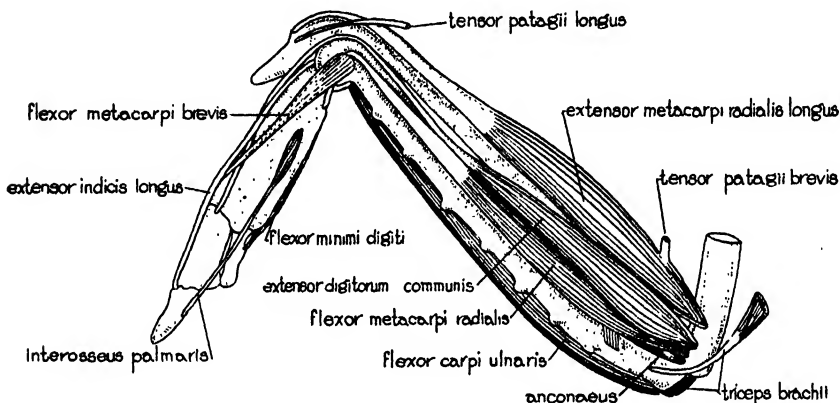


Fig. 14. *Ceophloeus pileatus picinus*; outer view of superficial muscles of the wing, $\times 1$. Mus. Vert. Zool. no. 54253.

M. deltoideus—

Origin.—By two heads; fleshy, by a long slender head from the dorsal surface of the furcular process of the scapula and from the contiguous surface of the furcula itself, and tendinous, on the outer side of the acromion of the scapula (figs. 10 and 13).

Insertion.—The fibers wind around dorsal to the shoulder joint, join the fibers that arise from the entire surface of the covering for the *os humero-scapulare*, and continue down the anconal aspect of the humerus for two-thirds of its length. This muscle has quite an extensive fleshy attachment on the humerus (figs. 11 and 12).

Remarks.—The most distal portion of this muscle does not end in a tendon and attach to the ectepicondylar prominence of the humerus as it does in the raven (Shufeldt, 1890, pp. 83, 97).

M. triceps brachii—

Origin.—The long head originates partly tendinous in a small area postero-dorsal to the glenoid facet of the scapula. The other portion of the muscle originates on the anconal aspect of the humerus and underlies in part the *M. deltoideus*. The proximal end is divided into two distinct heads. The internal head nearly fills the pneumatic fossa, the external head passes up along the border of the median crest. The supraspinatus muscle has its origin between the two

branches. The fibers of the two converge distally and pass down the anconal aspect of the humerus for two-thirds its length, lying just beneath the *M. deltoideus*. From this point it becomes partly tendinous and partly fleshy and passes over the elbow joint (figs. 6, 7, 10, 11, 12, *b*, and 13, *a*).

Insertion.—The long head becomes tendinous distally and is inserted on the proximal border of the external cotyla of the ulna. The other part of the *M. triceps brachii* passes over the elbow as a broad fleshy tendon and attaches on the entire external surface of the olecranon process of the ulna (figs. 14 and 16, *b*).

Remarks.—The *M. triceps brachii* is really two distinct muscles in the woodpecker; a few fibers partly connect the long head with the internal and external heads, but the connection is not very evident. The triceps is a strong extensor of the forearm.

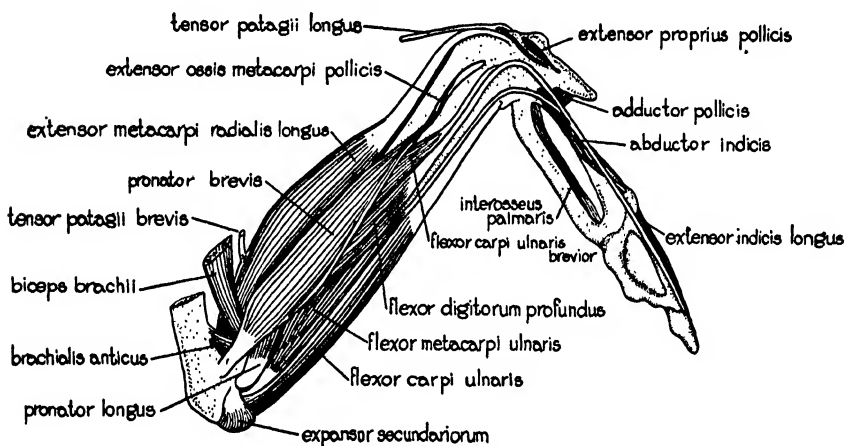


Fig. 15. *Ceophloeus pileatus picinus*; inner view of superficial muscles of the wing, $\times 1$, showing, among other things, the division of the tendon for the *M. tensor patagii longus*. Mus. Vert. Zool. no. 54253.

M. brachialis anticus—

Origin.—Fleshy, from a circumscribed depression on the palmar aspect of the distal end of the humerus (figs. 12, *a* and 15).

Insertion.—Fleshy, along quite an extensive area on the lateral surface, palmar aspect, of the proximal end of the ulna (fig. 16, *a*).

Remarks.—This is a short thick muscle; the fibers pass across the angle made by the humerus and ulna. It aids the *M. biceps brachii* in flexing the forearm.

M. extensor metacarpi radialis longus—

Origin.—By a strong tendon on the ectepicondylar prominence of the humerus in common with the *M. tensor patagii brevis* (figs. 12, *a*, 14 and 15).

Insertion.—By a strong tendon on the extreme point of the process of metacarpal I (fig. 17, *a*).

Remarks.—The strong tendon for the insertion of this muscle passes through the tendinal groove at the distal end of the radius, then to its point of insertion. This muscle is the principal extensor of the hand.

M. extensor digitorum communis—

Origin.—Tendinous in the small depression on the ectepicondylar prominence of the humerus just distal to the attachment of the *M. extensor metacarpi radialis longus* (figs. 12, a and 14).

Insertion.—Tendinous, to the base of the pollex and the proximal end of the first phalanx of the second digit (fig. 17, a).

Remarks.—This slender muscle lies beneath the *M. extensor metacarpi radialis longus* and is about two-thirds the diameter of that muscle. It tapers into a small tendon about two-thirds the distance

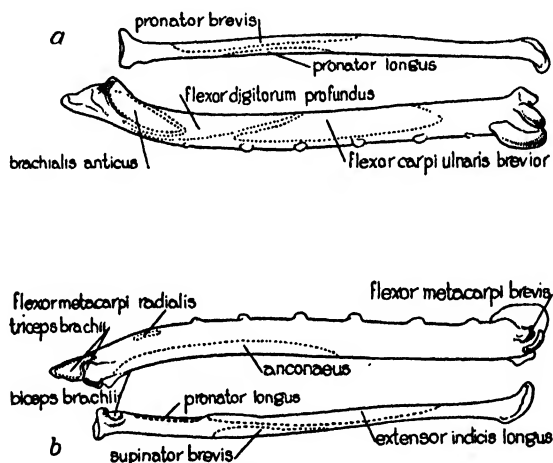


Fig. 16. *Ceophloeus pileatus picinus*; radius and ulna, $\times 1$; a, palmar view, showing areas for muscle attachments; b, anconal view, showing areas for muscle attachments. Mus. Vert. Zool. no. 31301.

up the arm. This tendon passes up over the distal end of the ulna, gives off a small tendinous branch which is inserted on the outer side of the base of the pollical digit, then passes down the tendinal groove on the anterior margin of metacarpal II and turns to the median line to its point of insertion on the first phalanx of the second digit.

M. supinator brevis—

Origin.—Tendinous, on the ectepicondylar prominence of the humerus just below the origin of the *M. extensor digitorum communis* (fig. 12, b).

Insertion.—Fleshy, along the outer anconal aspect of the middle one-third of the shaft of the radius (fig. 16, b).

M. flexor metacarpi radialis—

Origin.—Tendinous, from the ectepicondylar prominence of the distal end of the humerus and overlying the origin of the *M. supinator*

brevis, and by a tendinous slip from the proximal end, anconal aspect, of the ulna in line with, but distal to, the olecranon (figs. 12, *b*, 14, and 16, *b*).

Insertion.—Tendinous, on the prominence that projects downward from near the proximal end of metacarpal III (fig. 17, *a*).

Remarks.—This is a long slender muscle, the tendon of which passes distally through the deep narrow tendinal groove on the anconal aspect of the distal end of the ulna. It is a flexor of the hand.

M. pronator brevis—

Origin.—Tendinous, from a pit on the entepicondylar prominence of the humerus (figs. 12, *b* and 15).

Insertion.—Fleshy, on the middle third of the outer aspect of the shaft of the radius (fig. 16, *a*).

Remarks.—This is a wide flat muscle, the fibers of which fill up the interosseous space for the proximal two-thirds of the length of the forearm.

M. pronator longus—

Origin.—Tendinous, from the entepicondyle of the humerus, just distal to the origin of the *M. pronator brevis* (figs. 12, *b* and 15).

Insertion.—Fleshy, on the ulnar side of the proximal half of the shaft of the radius, beneath the insertion of the *M. pronator brevis* (fig. 16).

Remarks.—This muscle is considerably smaller than the *M. pronator brevis* and lies beneath that muscle for all but the very proximal end. From its point of origin it passes over the *M. brachialis anticus*, then comes in very close contact with the *M. extensor indicis longus*. It is a small flat muscle.

M. extensor ossis metacarpi pollicis—

Origin.—By two heads; one semitendinous, from immediately in front of the external cotyla of the ulna, the other just inside the tendon for the *M. biceps brachii* which is attached between the two heads.

Insertion.—Tendinous, on the external border of the process of metacarpal I (fig. 17, *a*).

Remarks.—This is a long slim muscle buried deep beneath the other muscles of the arm. From its point of origin it passes along the ulna and the interosseous membrane, being attached to these for some distance by fascia, then narrows into a small tendon about two-thirds the distance up the ulna. The tendon passes through the tendinal groove at the distal end of the radius and then to its point of insertion. Contraction of this muscle augments the action of the *M. extensor metacarpi radialis longus* in extending the hand.

M. anconaeus—

Origin.—Tendinous, on the ectepicondyle of the humerus (figs. 12, *b* and 14).

Insertion.—Fleshy, on the radial aspect of the proximal half of the ulna (fig. 16, *b*).

Remarks.—This muscle underlies, for the most part, the *M. flexor metacarpi radialis*. As the *M. anconaeus* passes up the ulna it gradually tapers to a point at the middle of the shaft of that bone.

M. extensor indicis longus—

Origin.—Fleshy, from the ancono-ulnar aspect of nearly the entire length of the shaft of the radius (figs. 14, 15, and 16, *b*).

Insertion.—By a strong tendon to the anterior portion of the proximal end of the distal phalanx of the second digit (fig. 17, *a*).

Remarks.—The tendon of this muscle passes over the distal end of the ulna with the tendons of the other muscles previously described. From the ulna the tendon passes over the tendon of the *M. extensor digitorum communis* and down the anterior border of the second digit to its point of insertion. It extends the distal phalanx of the second digit and aids in extending the entire hand.

M. flexor digitorum profundus—

Origin.—Fleshy, by two heads, from the inner aspect of the proximal one-third of the ulna. The heads branch to allow for the attachment of the *M. brachialis anticus* between them (figs. 15 and 16, *a*).

Insertion.—Tendinous, on the palmar side of the proximal end of the distal phalanx of the second digit (fig. 17, *b*).

Remarks.—The fibers of the two heads of this muscle soon converge into a small spindle-shaped muscle, which in turn becomes tendinous about two-thirds of the distance up the ulna. The tendon passes through a fibrous pulley on the inner side of the wrist joint, passes over the pisiform process of the carpometacarpus, and down the anterior margin of the hand to the point of insertion.

M. flexor carpi ulnaris—

Origin.—By a strong tendon, on the back side, anconal aspect, of the entepicondyle of the humerus, within the humero-ulnar pulley (figs. 12, *b*, 14, and 15).

Insertion.—By a strong flat tendon on the back of the cuneiform.

Remarks.—This is a large muscle which covers most of the under part of the arm. It is in close contact with the *M. flexor metacarpi ulnaris* (of Owen) which is to be described next. Shufeldt (*loc. cit.*) describes the *M. flexor carpi ulnaris* in the raven as arising by two heads, and as giving off a small tendinous slip just before reaching the ulnare ossicle of the carpus. This tendinous slip passes through a fibrous loop at the ulnar side of the carpus, and according to Shufeldt (*loc. cit.*)

... goes obliquely downward to the tendon of the *flexor digitorum profundus*, and merges with it at a point about opposite the distal apex of the pollex digit; or, more strictly speaking, is contained in the same sheath with this tendon of the *flexor digitorum profundus* tendon as far as the anterior rim of the proximal phalanx of the index digit, where this offshoot becomes inserted.

Later on, in speaking of the same muscle, Shufeldt (*op. cit.*, p. 144) says:

When we come to examine it carefully in the Raven, especially the distinctness of its external head, and a median fascia that runs longitudinally through its belly, and finally its distal tendinous offshoot, it is not difficult for us to imagine that the muscle originally was composed of two parts, or perhaps two distinct muscles (figs. 31 and 36).

In the woodpecker we find the muscles quite distinct although the two parts are enclosed for most of their length in the same fibrous sheath. I consider them here as being separate and distinct. The smaller of the two will be described next.

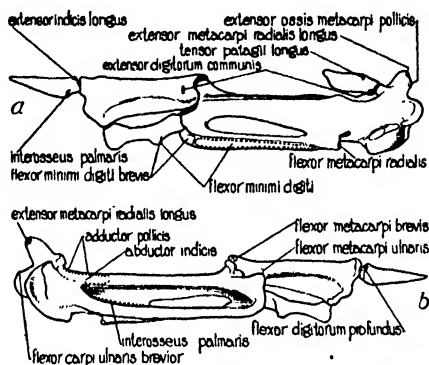


Fig. 17. *Ceophloeus pileatus pioinus*; carpometacarpus and phalanges, $\times 1$, showing areas for muscle attachments; a, outer view; b, inner view. Mus. Vert. Zool. no. 31301.

M. flexor metacarpi ulnaris—

Origin.—Tendinous, from the entepicondyle of the humerus, near the origin of the *M. flexor carpi ulnaris* (figs. 12 and 15).

Insertion.—Tendinous, to the inner proximal rim of the proximal phalanx of the second digit (fig. 17, b).

Remarks.—This muscle, soon after its origin, comes in close contact with the *M. flexor carpi ulnaris*, and is partly bound to that muscle by fibrous tissue. Near the wrist-joint the tendon of the *M. flexor metacarpi ulnaris* departs from that of the other muscle, passes through a fibrous pulley on the inner side of the wrist joint, then joins the tendon of the *M. flexor digitorum profundus* and passes nearly to its point of insertion in the same sheath as that tendon.

M. flexor carpi ulnaris brevior—

Origin.—Fleshy, from a rather broad area covering the middle half of the palmar aspect of the shaft of the ulna (figs. 15 and 16, a).

Insertion.—By a tendon on the external rim of the trochlea of the carpometacarpus (fig. 17, b).

Remarks.—This is a flat muscle underlying the *M. flexor digitorum profundus*. The tendon passes through, from the inner side of the

wrist joint, in front of the scapholunar to be inserted on the outer side of the carpometacarpus. Contraction of this muscle rotates the carpometacarpus in such a way as to tilt the primaries upward.

M. expansor secundariorum—

Origin.—By tendinous fascia, from the covering of the entepicondyle of the humerus (fig. 15).

Insertion.—By tendons, to the bases of secondaries 9, 10, and 11.

Remarks.—This is a short wide muscle that passes transversely across the elbow joints. Contraction depresses and spreads the secondaries to which the muscle is attached.

M. extensor proprius pollicis—

Origin.—Tendinous, from the inner side of the tendon of the

M. extensor metacarpi radialis longus.

Insertion.—Tendinous, on the inner side of the pollical digit, about one-third of the distance distal to its articular end (fig. 15).

Remarks.—This is a small spindle-shaped muscle 7.5 mm. long; contraction extends the pollical digit.

M. adductor pollicis—

Origin.—Fleshy, from the anterior surface of the proximal end of metacarpal II, just distal to the pollical facet of metacarpal I (figs. 15 and 17, b).

Insertion.—Fleshy, on the under side of the proximal half of the pollex.

Remarks.—This is a very short muscle located within the angle that the pollex makes with metacarpal II. Shufeldt (1890, p. 148) describes the insertion of this muscle for the raven as follows: "Its fibers converge as they pass down behind the thumb joint, to become converted into a delicate tendon which is inserted into the distal apex of that phalanx." In the woodpecker I find no tendinous attachment, but both the origin and insertion are fleshy.

M. flexor minimi digiti—

Origin.—Fleshy, from the posterior aspect of metacarpal III, except for the extreme distal end (figs. 14 and 17, a).

Insertion.—By a tendon to the small tubercle that extends downward from the center of the third digit (fig. 17, a).

Remarks.—This muscle acts as a feeble flexor of the third digit. It has a more extensive attachment in the woodpecker than that described for the raven by Shufeldt (1890, p. 149).

M. flexor minimi digiti brevis—

Origin.—Fleshy, from the posterior aspect of the distal end of metacarpal III and from the tendon of the *M. flexor minimi digiti* (fig. 17, a).

Insertion.—On the third digit in common with the *M. flexor minimi digiti*.

Remarks.—This muscle is in very close contact with the *M. flexor minimi digiti* which overlies it completely and almost conceals it from view.

M. flexor metacarpi brevis—

Origin.—Partly fleshy and partly tendinous, by a broad thin band, from the anconal aspect of the distal end of the ulna (figs. 14 and 16, *b*).

Insertion.—By a small tendon, to the anterior portion of the proximal end of the proximal phalanx of the second digit (fig. 17, *b*).

Remarks.—From its point of origin this muscle continues down the outer surface of the carpometacarpus as a broad flat band. The muscle fibers cease opposite the pollical digit and the broad flat tendinous band gradually tapers into a small strong tendon at the point of insertion.

M. interosseus palmaris—

Origin.—Fleshy, in the intermetacarpal space, on the anterior border of metacarpal III (figs. 14, 15, and 17, *b*).

Insertion.—By a tendon in the middle of the postero-external border of the distal phalanx of the second digit (fig. 17, *a*).

Remarks.—This is the only muscle that I find occupying the interosseous space of the carpometacarpus in the woodpecker.

M. abductor indicis—

Origin.—Fleshy, from the pisiform process, on the inner aspect of the carpometacarpus, and from a small area distal to it (figs. 15 and 17, *b*).

Insertion.—Tendinous, on the anterior border of the base of the proximal phalanx of the second digit (fig. 17, *b*).

MUSCLES OF THE LOWER EXTREMITY

M. sartorius—

Origin.—By a flat tendon from the neural crests of the three vertebrae just anterior to the synsacrum, and from a small area on the lateral border of the anterior portion of the ilium (figs. 18, 19, and 24).

Insertion.—Partly fleshy and partly tendinous, on the border of the inner cnemial crest of the tibiotarsus. (fig. 21, *a*).

Remarks.—This muscle is really divided into two heads at its origin. The one head originates from the neural crests of the three vertebrae just anterior to the synsacrum and is exposed with the superficial muscles of the limb. It lies anterior to the *M. gluteus primus*. The other part is exposed by removing the anterior portion of the *M. gluteus primus*. The second head has its origin mainly from the lateral border of the pelvis, but a few fibers pass beneath the first head to originate from the neural crest of the first free vertebra anterior to the synsacrum.

M. gluteus primus—

Origin.—By thin fascia from the anterior iliac crest, from the dorsal surface of the antitrochanter, and from the greater portion of the posterior iliac crest (figs. 18 and 24).

Insertion.—By deep fascia to the fibrous covering of the patella and, in conjunction with the *M. extensor femoris*, to the superior border of the cnemial crest of the tibiotarsus (fig. 21, b).

Remarks.—This muscle is divided into two distinct muscular parts. The anterior portion overlies, in part, the *M. sartorius* and in part the *M. extensor femoris*. The posterior portion, which is termed *tensor fasciae* by some authors, overlies in part the *M. biceps femoris*, and in part the *M. extensor femoris*. A very thin fascia overlies the central portion of the *M. extensor femoris* and connects the two portions of the *M. gluteus primus*. The fibers of the *M. extensor femoris* are clearly visible through this fascia.

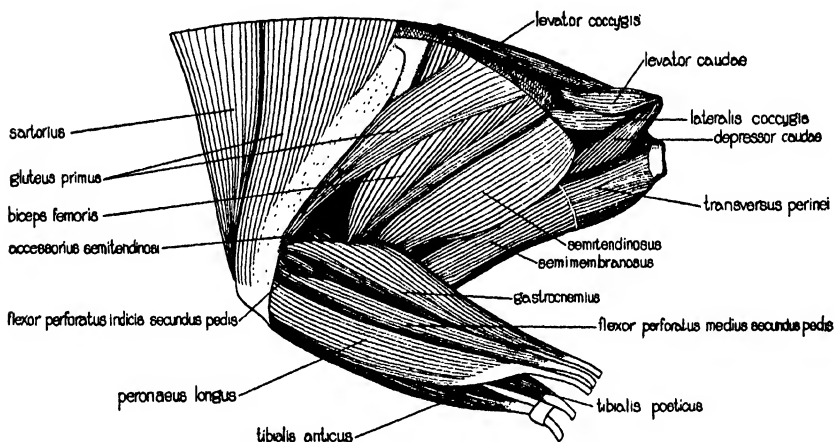


Fig. 18. *Ceophloeus pileatus picinus*; outer view of superficial thigh and lower leg muscles, $\times 1$. Mus. Vert. Zool. no. 54253.

M. gluteus medius—

Origin.—Fleshy, from the anterior iliac crest, just beneath that of the *M. gluteus primus*, and from most of the concave surface of the ilium anterior to the acetabulum (figs. 19 and 24).

Insertion.—By a strong tendon to the external surface of the trochanter of the femur (fig. 20, a).

Remarks.—This short thick muscle is completely covered by the *M. gluteus primus*, but overlies, in part, the origin of the *M. gluteus minimus*.

M. gluteus minimus—

Origin.—Semitendinous, from the outer border of the anterior one-fourth of the preacetabular portion of the ilium (figs. 19 and 24).

Insertion.—By a tendon on the outer aspect of the femur just below the trochanter and between the two heads of the *M. extensor femoris* (fig. 20, a).

Remarks.—This slip of muscle lies, for the most part, anterior to the *M. gluteus medius*, and is exposed upon the removal of the *M. gluteus primus*.

M. gluteus quartus—

Origin.—Semitendinous, from the outer border of the ilium, just anterior to the acetabulum (figs. 19 and 24).

Insertion.—By a tendon, on the external aspect of the trochanter of the femur, anterior to the insertion of the *M. gluteus medius* (fig. 20, a).

Remarks.—This small slip of muscle is quite distinct from the *M. gluteus minimus* and runs nearly parallel to it.

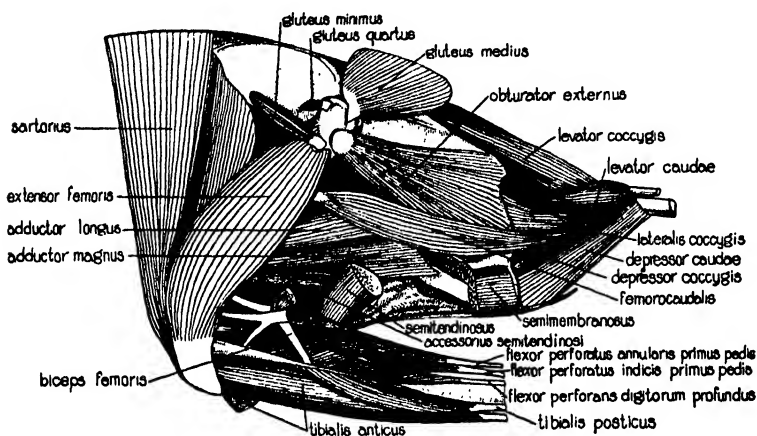


Fig. 19. *Ceophloeus pileatus pioinus*; outer view of the deep muscles of the thigh and lower leg region, $\times 1$, showing, among other things, the *M. accessorius semitendinosi* and the tendinous loop that supports the *M. biceps femoris*; the *M. gluteus medius* is deflected back so as to expose the underlying muscles. Mus. Vert. Zool. no. 54253.

M. extensor femoris—

Origin.—By a small tendon from the trochanteric ridge of the femur, and fleshy from nearly the entire surface of the outer and anterior surfaces of the shaft of the femur (figs. 19 and 20).

Insertion.—By a strong tendon on the superior border of the entire cnemial crest of the tibiotarsus (fig. 21, b).

Remarks.—This muscle is divided into two distinct parts in many birds, but in the woodpecker the fibers are all very closely connected and one cannot separate the muscle into two parts. The fibers at the distal end form, with those of the *M. gluteus primus*, a wide, heavy, tendinous band which extends down over the knee joint. The patella is imbedded in this heavy tendinous band.

M. vastus internus—

Origin.—Fleshy, from nearly the entire postero-internal aspect of the femur (fig. 20, c).

Insertion.—By a strong tendon, at the base of the cnemial crest, on the internal surface of the head of the tibiotarsus (fig. 21, b).

Remarks.—The origin of this muscle is quite extensive. At the proximal end of the femur it occupies all of the posterior and part of the internal aspect of the femur. At the distal end it occupies the internal and part of the posterior surfaces. It takes a slightly spiral path as it passes down the femur. The fibers converge toward a median tendinous strip which passes down the distal two-thirds of the muscle length.

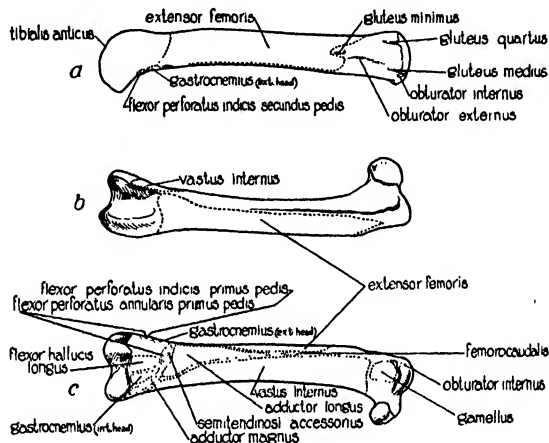


Fig. 20. *Ceophloeus pileatus picinus*; femur, $\times 1$, showing muscle attachments; a, outer view; b, anterior view; c, posterior view. Mus. Vert. Zool. no. 31301.

M. biceps femoris—

Origin.—By tendinous fascia, from the posterior iliac crest, extending posteriorly for three-fourths the length of the postacetabular region of the ilium (figs. 18 and 24).

Insertion.—By a strong tendon to a small prominence on the distal third of the fibula (figs. 19 and 21, a).

Remarks.—This muscle converges as it passes distally from its origin. It passes between the flexor muscles of the leg to its point of insertion on the fibula, and in so doing passes through a long tendinous loop which drops down from the distal end of the femur (fig. 19). This tendinous loop has two attachments to the external surface of the femur; one is 2 mm. proximal to that of the external head of the *M. gastrocnemius*, the other attaches in common with the tendon of the external head of the *M. gastrocnemius*. There is a third branch of the loop which attaches to the proximal end of the fibula; this latter branch anchors the loop so that it cannot swing backward upon contraction of the muscle. This loop, as has been pointed out by previous authors, is a neat contrivance to enable the *M. biceps femoris* to effect a more rapid and extensive inflection of the leg than it otherwise could produce by the simple contraction of the fibers.

M. semitendinosus—

Origin.—Semitendinous, from the posterior one-fourth of the posterior iliac crest, just caudad to the origin of the *M. biceps femoris*, and by a few fibers, at its posterior border, from the underlying fascia (figs. 18 and 24).

Insertion.—By a flat thin tendon along the central portion of the sharp crest on the inner aspect of the proximal two-fifths of the tibiotarsus. The flat thin tendon is 5 mm. wide at its point of insertion (fig. 21, b).

Remarks.—Just before the fibers become tendinous, at the point of insertion, this muscle gives off the *M. accessorius semitendinosi* and a small tendinous slip, from the same area, to the internal head of the *M. gastrocnemius*. This tendinous slip to the *M. gastrocnemius* is absent in those forms that do not have the *M. accessorius semitendinosi* present.

M. accessorius semitendinosi—

Origin.—By weak fascia from a small transverse line slightly above the external condyle of the femur, posterior aspect (fig. 20, c).

Insertion.—Into a tendinous raphe common to this muscle and the *M. semitendinosus* (fig. 19).

Remarks.—This muscle is absent in the following genera: *Picoides*, *Sphyrpicus*, *Dryobates*, and *Xenopicus*; it is present in *Colaptes*, *Asyndesmus*, *Melanerpes*, *Balanosphyra*, *Centurus*, and *Ceophloeus*. Garrod (1873, p. 630) has suggested that the *Pici* may be divided into two subfamilies according to whether the accessory semitendinosus is present or absent. He was working chiefly with Old World forms. The presence or absence of this muscle apparently indicates group relationships within the family Picidae. Each North American genus, members of which have the muscle absent, has members in which the skulls are distinct from the skulls of those that have the muscle present. The frontals are folded under along the craniofacial angle and the skull, as a whole, is proportionately wider and shorter than in types with the muscle present. When we find two or more pronounced structural characters, in the muscles and skeleton, which are constantly different in two groups, the evidence is strengthened for considering those two groups as quite distinct.

M. semimembranosus—

Origin.—Fleshy, from the outer surface of the posterior one-fourth of the ischium (figs. 18, 19, and 24).

Insertion.—By a thin flat tendon, on the inner aspect of the tibiotarsus, along the longitudinal axis proximal to the center of the shaft of the bone (fig. 21, b).

Remarks.—This muscle finds its way to the shaft of the tibiotarsus between the other muscles of the leg. Its flat tendon is 6.5 mm. wide at the point of insertion.

M. femorocaudalis

Origin.—By a small flat tendon near the center of the shaft of the femur on its postero-external aspect (figs. 19 and 20, c).

Insertion.—By a small tendon in the middle of the lateral border of the disc of the pygostyle (fig. 29).

Remarks.—This is a neat slender muscle which tapers gradually as it passes posteriorly to its point of insertion. Contraction pulls the pygostyle laterally and ventrally. The same result is effected by a forward movement of the femur without contraction of the muscle.

M. obturator externus—

Origin.—Fleshy, from the periphery of the ilio-ischiatic fenestra and the concavity behind it on the outer surface of the ischium. The upper border lies along the posterior iliac crest just beneath the origins of the *M. biceps femoris* and the *M. semitendinosus*. The posterior border reaches nearly to the *M. semimembranosus*, and the ventral border to the pubis (figs. 19 and 24).

Insertion.—By a strong flat tendon on the outer aspect of the base of the trochanter of the femur. The insertion is just opposite and proximal to that of the *M. gluteus minimus* (fig. 20, *a*).

Remarks.—This is a short thick muscle with quite an extensive origin on the ischium. It overlies the ilio-ischiatic fenestra and the anterior two-thirds of the ischio-pubic fenestra. Contraction pulls the femur backward.

M. obturator internus—

Origin.—Fleshy, from the membrane stretched across the ischio-pubic fenestra and from the margins of the bones surrounding this fenestra.

Insertion.—By a strong tendon on the superior surface of the trochanter of the femur just opposite that of the *M. gluteus medius* (fig. 20, *a* and *c*).

M. gamellus—

Origin.—Fleshy, from a small area on the external surface of the pubis, just ventral and anterior to the obturator foramen (fig. 24).

Insertion.—Fleshy, on a small area beneath the trochanter on the posterior aspect of the femur (fig. 20, *c*), but not in common with the *M. obturator internus* as in the raven.

M. adductor longus—

Origin.—Semitendinous, along the outer border of the pubis, from a point just posterior to the obturator foramen, to a point about one half of the way back along the ischio-pubic fenestra where it meets the anterior border of the *M. adductor magnus* (figs. 19 and 24).

Insertion.—Fleshy, by a rather narrow line, on the posterior aspect of the distal half of the shaft of the femur, but expanding into a wide area toward the distal end of the femur (fig. 20, *c*).

Remarks.—This muscle is very closely connected with the *M. adductor magnus*. Its insertion on the femur forms quite an extensive triangle with the apex toward the proximal end of the femur.

M. adductor magnus—

Origin.—Semitendinous, from the pubis, posterior to the *M. adductor longus* and extending back for nearly half the length of the ischio-pubic fenestra (figs. 19 and 24).

Insertion.—Semitendinous, along an oblique line on the posterior aspect of the distal end of the femur, just above the inner border of the internal condyle (fig. 20, c).

M. gastrocnemius—

Origin.—External head by a strong tendon, in common with the ligamentous loop for the biceps, above the fibular condyle on the external surface of the distal end of the femur (fig. 20, c); tibial head fleshy, from a small area on the inner aspect of the head of the tibiotarsus, below the insertion of the *M. vastus internus*, from the free inner border of the adjoining cnemial crest and from the sharp longitudinal crest that extends distally on the inner surface of the tibiotarsus (fig. 21); internal head fleshy, from the posterior aspect of the distal end of the femur, just above the internal condyle (fig. 20, c).

Insertion.—By a strong flat tendon to the hypotarsus of the tarsometatarsus (fig. 22, a).

Remarks.—At the proximal end this muscle is divided into three distinct heads. The external head is considerably the largest, being larger than the other two combined, and makes up the bulk of the calf of the leg (fig. 18). The internal head is smallest and is converted into a flat thin tendon for the distal three-fourths of its length. Near its proximal end it receives a tendinous slip from the *M. semitendinosus*.

The three heads converge distally into a strong flat tendon that passes over the back of the tarsal joint to be inserted on the hypotarsus of the latter bone. From the point of insertion a few fibers of the tendon pass down the back of the tarsometatarsus and merge with the podothecal sheath, which contains the flexor tendons.

M. soleus—

Origin.—Fleshy, from the inner border of the posterior aspect of the tibiotarsus; it extends along a narrow strip from beneath the head of the tibiotarsus distally along the posterior border of the sharp longitudinal crest which extends down the inner surface of the bone (fig. 21, b).

Insertion.—By a delicate tendon on the inner border of the tibial cartilage.

Remarks.—This is a small spindle-shaped muscle lying, for the most part, beneath the tibial head of the *M. gastrocnemius*.

M. peroneus longus—

Origin.—By tendinous fascia, from a small area on the outer border of the raised portion of the cnemial crest of the tibiotarsus, and from the dense fascia that covers the knee joint (figs. 18 and 21, a).

Insertion.—Tendinous, on the outer border of the tibial cartilage and in the tough fascia that covers the outer aspect of the external condyle of the tibiotarsus.

Remarks.—This is a thin flat muscle that covers a small portion of the *M. tibialis anticus*. It becomes tendinous about three-fourths of the distance down the leg and the tendon passes obliquely to the back of the leg. At the extreme distal end the small tendon bifurcates, each branch passing to its respective point of insertion.

M. tibialis anticus—

Origin.—By two heads; one head fleshy, from the entire anterior rim of the cnemial crest of the tibiotarsus (fig. 21, *a*), and the other head by a strong tendon from a small depression on the anterior aspect of the external condyle of the femur (fig. 20, *a*).

Insertion.—By a strong tendon to a small tubercle on the anterior aspect of the proximal end of the tarsometatarsus distal to the head of that bone (fig. 22, *a*).

Remarks.—This muscle makes up nearly all of the front of the lower leg (figs. 18 and 19). The two heads are distinct for most of their distance, but lie close to one another. Distally they converge into a strong tendon which passes through a tendinous loop at the distal end of the tibiotarsus and then to the point of insertion.

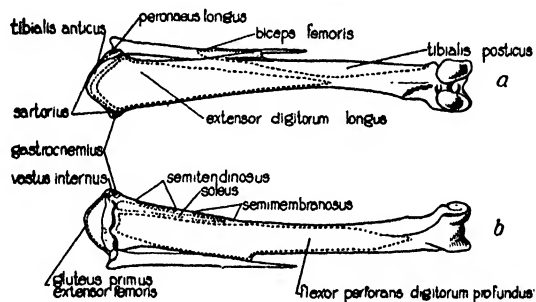


Fig. 21. *Ceophloeus pileatus picinus*; tibiotarsus and fibula, $\times 1$, showing areas for muscle attachments; *a*, anterior view; *b*, posterior view. Mus. Vert. Zool. no. 31301.

M. extensor digitorum longus—

Origin.—Fleshy, from an extensive area on the anterior portion of the tibiotarsus below the anterior ridge of the cnemial crest, then distally for over half the length of the tibiotarsus (fig. 21, *a*).

Insertion.—By three small tendons, to the dorsal side of the base of each of the claw phalanges of the second, third, and fourth digits.

Remarks.—This long slender muscle gradually tapers to a round tendon at the distal end of the tibiotarsus at which point the tendon passes through the bony bridge just above and between the condyles. The tendon next passes across the joint and through another bony canal at the proximal end of the tarsometatarsus, then down the anterior border of this bone to its distal end where the tendon divides into three small tendons each of which passes out along the dorsal surface of its respective digit. Because of the backward extension of the fourth digit, in the woodpecker, the tendon for this digit turns back upon itself for a short distance before passing out along the digit. The small tendons are bound firmly to the digits, at each of the joints, by heavy fascia. Contraction extends the second, third, and fourth digits.

M. extensor hallucis brevis—

Origin.—Fleshy, from the internal aspect of the head of the tarsometatarsus, just below its summit and down the shaft nearly to the point of insertion of the *M. tibialis anticus* (fig. 22, *a*).

Insertion.—By a small tendon at the base of the claw phalanx of the first digit.

Remarks.—This small muscle tapers into a fine tendon about one-third the distance down the tarsometatarsus. The tendon continues down the inner side of the tarsometatarsus to the hallux, then out to its point of insertion. Contraction extends the hallucal digit.

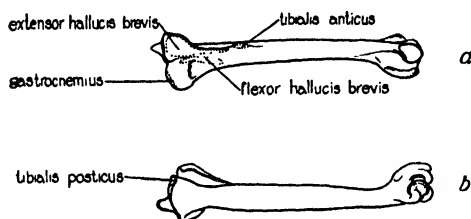


Fig. 22. *Ceophloeus pileatus picinus*; tarsometatarsus, $\times 1$, showing areas for muscle attachments; *a*, inner view; *b*, outer view. Mus. Vert. Zool. no. 31301.

M. tibialis posticus—

Origin.—Fleshy, from the distal two-thirds of the fibula and the antero-external aspect of the distal two-thirds of the tibiotarsus (figs. 19 and 21, *a*).

Insertion.—By a strong tendon on the external border of the head of the tarsometatarsus (fig. 22, *b*).

Remarks.—The *M. peroneus longus* overlies the proximal portion of this muscle, but the distal portion is exposed with the superficial muscles of the leg.

M. flexor perforatus indicis secundus pedis—

Origin.—Tendinous, from the outer surface of the external condyle of the femur, just below that of the external head of the *M. gastrocnemius* (figs. 18 and 20, *a*).

Insertion.—By a delicate tendon to the inner and under surface of the second phalanx of the second digit.

Remarks.—This is a small slender muscle which becomes tendinous about half way down the leg. The extreme proximal end of the muscle is exposed with the superficial muscles, but it is soon buried beneath the external head of the *M. gastrocnemius*. The tendon passes through the tibial cartilage and a canal in the hypotarsus of the tarsometatarsus, then down the back of the latter bone and out along the second digit.

M. flexor hallucis longus—

Origin.—Semitendinous, from the posterior aspect of the femur, between the two condyles. I find only one head in the woodpecker (fig. 20, *c*).

Insertion.—By three tendons, to the first, second, and fourth digits, respectively.

Remarks.—This large flexor of the leg becomes tendinous at the ankle joint. The tendon passes through the outer portion of the tibial cartilage and through the deep groove external to the hypotarsus, then down the posterior aspect of the tarsometatarsus, swinging to the middle of the bone at its distal end. At the base of the toes this tendon divides into three parts; the three divisions pass, respectively, to the first, second, and fourth digits (fig. 23, *a*). Each branch passes out along the inner surface of its respective toe to be inserted at the base of the ungual phalanx. Just before branching the tendon sends a fibrous *vinculum* to the tendon of the *M. flexor perforans digitorum profundus* so that contraction of the *M. flexor hallucis longus* really effects a flexion of all four digits.

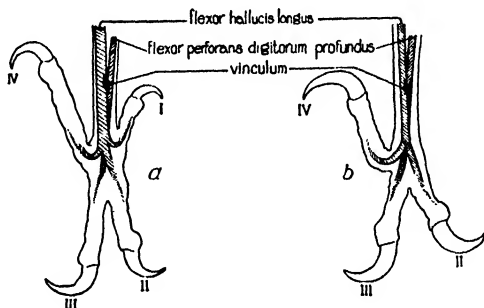


Fig. 23. Ventral view (diagrammatic) of feet, $\times 1$, showing the disposition of the deep plantar tendons in the four-toed and three-toed forms; *a*, *Melanerpes erythrocephalus*; *b*, *Picoides arcticus*.

The tripartite division of this tendon is quite peculiar in birds. Garrod (1875) found this arrangement only in birds with scansorial feet and records it for *Gecinys viridis* [= *Picus viridis* Linn.] in the woodpeckers. In most birds the tendon of the *M. flexor perforans digitorum profundus* is the one that has the three divisions and the *M. flexor hallucis longus* passes directly to the first digit. In *Picoides*, where the first digit is absent, this tendon sends two branches to the second and fourth toes, respectively. Garrod (*loc. cit.*, p. 347) in speaking of birds with the hallux absent says: "In all these cases both the *flexor longus hallucis* and the *flexor perforans digitorum* muscles are present and well developed, only they blend completely opposite the upper part of the tarso-metatarses to form a single common tendon to be distributed, on its splitting up, to the anterior toes—to the two of *Struthio*, the three of *Rhea*, *Otis*, etc." The condition in *Picoides* is somewhat different in that the two tendons do not unite into a common tendon, but are connected only by a *vinculum* as in the other forms (fig. 23, *b*). This muscle, in the woodpecker, is the most powerful of the flexors of the toes.

M. flexor hallucis brevis—

Origin.—Fleshy, from a small area just below the head of the tarsometatarsus on the inner border of the posterior aspect of the bone (fig. 22, *a*).

Insertion.—By a tendon on the under surface of the base of the first phalanx of the hallual digit.

Remarks.—This is a very small triangular muscle 8 mm. long. It tapers into a small tendon that passes behind metatarsal I and turns back upon itself to be inserted on the underside of the basal phalanx of the first digit.

M. flexor perforatus annularis primus pedis—

Origin.—By two heads; one fleshy, from the posterior aspect of the femur, between the two condyles, and the other tendinous, above the fibular groove of the external condyle of the femur, just below the origin of the *M. flexor perforatus indicis secundus pedis* (fig. 20, c).

Insertion.—By a tendon to the basal phalanx of the fourth digit.

Remarks.—The two heads of this muscle converge into a common tendon at the distal end of the tibiotarsus. The tendon passes through the tibial cartilage and the hypotarsus, then down the back of the leg and through the groove at the distal end of the tarsometatarsus and out along the ventral surface of the fourth digit.

M. flexor perforatus medius primus pedis—

Origin.—By two heads; one fleshy, from the inner side of the carneous portion of the internal head of the *M. flexor perforatus annularis primus pedis* and by a small tendinous slip, in common with the *M. flexor perforatus indicis primus pedis*, from the femur; the other head originates by a tendon, from the external condyle of the femur, in common with the tendon of the external head of the *M. flexor perforatus annularis primus pedis*.

Insertion.—By a tendon, on the proximal phalanx of the third digit.

M. flexor perforatus medius secundus pedis—

Origin.—Tendinous, from the postero-external surface of the external condyle of the femur, and fleshy, from the outer aspect of the fibula (fig. 18).

Insertion.—By a strong tendon to the second phalanx of the third digit. The insertion is on the inferior surface at the base of the phalanx.

Remarks.—This is one of the larger flexors of the leg. It is exposed, upon removal of the skin, for its entire length on the outer surface of the leg. It becomes tendinous at the ankle joint and the tendon passes through the outer edge of the tibial cartilage, through the posterior canal in the hypotarsus, and down the posterior aspect of the tarsometatarsus to the third digit.

M. flexor perforatus indicis primus pedis—

Origin.—By a strong flat tendon on the posterior aspect of the distal end of the femur just above the external condyle, and in common with the external head of the *M. flexor perforatus annularis primus pedis* (figs. 19 and 20, c).

Insertion.—By a tendon at the base of the first phalanx of the second digit.

Remarks.—This is one of the smaller flexors of the leg. It is a flat tendon for its proximal two-thirds then it enlarges into a short flat muscle to become tendinous again at the ankle joint. The small tendon passes through the tibial cartilage and a bony canal in the hypotarsus, then down the inner aspect of the back of the tarsometatarsus to its point of insertion.

M. flexor perforans digitorum profundus—

Origin.—Fleshy, from the internal condyle of the femur and from the posterior aspect of the proximal half of the tibiotarsus (figs. 19 and 21, b).

Insertion.—By a strong tendon to the underside of the base of the ungual phalanx of the third digit.

Remarks.—This is the deepest flexor of the leg and lies next to the tibiotarsus. It is a flat broad muscle which tapers to a small round tendon at the distal end. The tendon passes through the inner border of the tibial cartilage then through the deepest of the bony canals of the hypotarsus and down the back of the tibiotarsus next to the bone. Near the distal end of the tarsometatarsus the tendon receives a fibrous *vinculum* from the tendon of the *M. flexor hallucis longus*. The tendon passes beneath that of the latter muscle and at the sole of the foot it lies deepest of all the tendons of that region. It passes out along the palmar aspect of the third digit to be inserted at the base of the ungual phalanx (fig. 23).

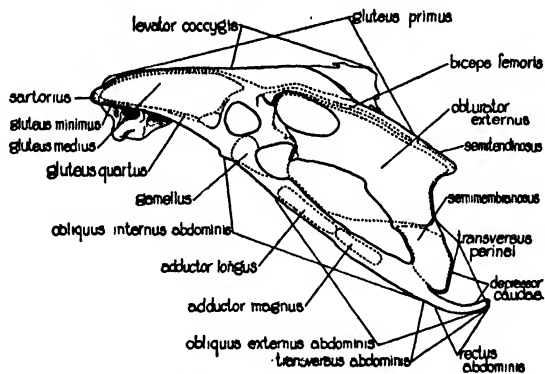


Fig. 24. *Ceophloeus pileatus picinus*; lateral view of pelvis, $\times 1$, showing areas for muscle attachments. Mus. Vert. Zool. no. 15680.

MUSCLES OF THE TONGUE AND AIR PASSAGES

M. mylohyoideus—

Origin.—From the inner side of the lower mandible along a line beneath the rolled-under edge of the lower horny sheath, overlying the *M. geniohyoideus* (fig. 27, b).

Insertion.—In a tendinous raphe in the mid-ventral line.

Remarks.—This muscle lies dorsal to the *M. geniohyoideus* and not ventral to it as Shufeldt shows for the raven (1890, p. 21), hence it does not, in the woodpecker, enclose the *M. geniohyoideus*.

M. geniohyoideus—

Origin.—Fleshy, from the inner surface of the anterior portion of the lower mandible, with about one-half of the area of attachment posterior to, and one-half anterior to the posterior border of the median symphysis (fig. 27, b).

Insertion.—Along the distal two-thirds of the thyrohyal (fig. 25).

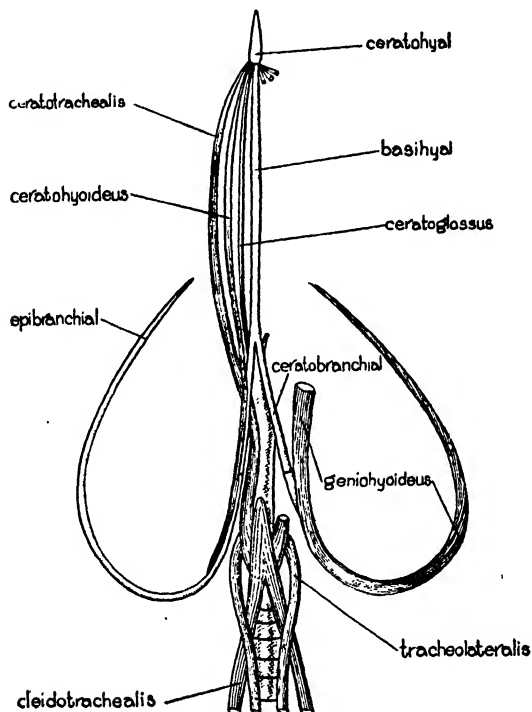


Fig. 25. *Ceophloeus pileatus picinus*; ventral view of tongue muscles, $\times 1$, showing, among other things, the attachment of the *M. ceratotrachealis* to the trachea; it does not, in this form, wind around the trachea as was shown by Owen (1866) for a woodpecker. Mus. Vert. Zool. no. 54253.

Remarks.—The point of origin is quite different in the woodpecker from that shown by Shufeldt for the raven (1890, p. 21). Its relation to the *M. mylohyoideus* is also markedly different as was stated under the remarks on that muscle. The *M. geniohyoideus* forms a sheath around the thyrohyal (epibranchial) and the fibers take a spiral course around that bone as they pass to its distal end.

M. ceratohyoideus—

Origin.—Fleshy, from the lateral border of the distal half of the first segment (ceratobranchial) and the proximal one-third of the second segment (epibranchial) of the thyrohyal.

Insertion.—Tendinous, at the base of the ceratohyal (fig. 25).

Remarks.—The fibers converge near the point of origin and continue, as a small tendon, along the proximal half of the first segment (ceratobranchial) of the thyrohyal, and along the entire length of the basihyal to the point of insertion. This muscle evidently serves, when acting singly, to pull the tongue to the side; if acting in conjunction with the muscle from the other side it would aid in depressing the tongue.

M. ceratoglossus—

Origin.—Fleshy, from the inner dorsal border of the ceratobranchial.

Insertion.—On the ceratohyal beside the *M. ceratohyoideus* (fig. 25).

Remarks.—The fibers become converted into a slender tendon near the union of the ceratobranchial and the basihyal. The tendon passes along the dorso-lateral portion of the basihyal with the tendon of the *M. ceratohyoideus*.

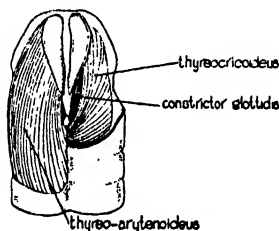


Fig. 26. *Colaptes auratus luteus*; superior view of the muscles of the glottis, $\times 3$, showing the muscles that open and close the glottis; the *M. thyreo-arytenoideus* has been removed from the right side in order to expose the underlying muscles. Mus. Vert. Zool. no. 54275.

M. ceratotrachealis—

Origin.—On the dorsal border of the trachea about seven rings down from the larynx.

Insertion.—By a delicate tendon, lateral to the base of the ceratohyal.

Remarks.—This is a long slender muscle on either side (fig. 25); the two muscles fuse dorsal to the trachea where they originate. From the point of origin they pass antero-ventrally, each following its respective branchial, then the basihyal, out to its union with the ceratohyal, where the muscle becomes tendinous. Owen (1866, fig. 77) figures this muscle in the woodpecker as making four turns around the trachea; however, he does not mention the species of woodpecker figured. This muscle serves to retract the tongue.

M. constrictor glottidis—

Origin.—Along the inner margin of the proximal half of the arytenoid bone.

Insertion.—On the median cricoid bone (fig. 26).

Remarks.—Contraction pulls the arytenoid bones together thereby closing the glottis.

M. thyreo-arytenoideus—

Origin.—Fleshy, from the outer border of the thyroid plate and also from its posterior border back of the cricoid bone.

Insertion.—Semitendinous, along the entire outer border of the anterior elevated portion of the arytenoid bone (fig. 26).

Remarks.—This is the largest and most superficial of the intrinsic muscles of the glottis. Contraction opens the glottis, at the anterior end of the larynx, by pulling the arytenoid bones outward.

M. thyreocricoideus—

Origin.—Fleshy, along the surface of thyroid plate, within the origin of the *M. thyreo-arytenoideus*.

Insertion.—Fleshy, along the outer proximal half of the arytenoid bone and to the outer border of the cricoid bone (fig. 26).

Remarks.—Contraction aids in opening the glottis. This muscle lies beneath the *M. thyreo-arytenoideus* and above the *M. constrictor glottidis*.

M. tracheolateralis—

Origin.—Fleshy, from the lateral anterior border of the first half ring of the syrinx and by fascia from the lateral surfaces of the rings of the trachea.

Insertion.—On the ventral border of the superior larynx (fig. 25).

Remarks.—This is a narrow ribbon-like muscle on either side of the trachea. Near the superior larynx the muscles from the two sides converge in the mid-ventral line. A median portion of the muscle extends forward to the *M. mylohyoideus*. The *M. tracheolateralis* is covered, for most of its length, by the *M. cleidotrachealis*.

M. sternotrachealis—

Origin.—Fleshy, from the inner surface of the most anterior sternal rib.

Insertion.—Fleshy, on the lateral border of the proximal one-fifth of the trachea.

Remarks.—This muscle, in the woodpecker, has no connection with the costal process of the sternum as was described for the raven by Shufeldt (1890), but attaches wholly on the most anterior sternal rib.

This muscle seems to correspond to the proximal portion of Gadow's *M. sterno-hyoideus* (1891, p. 310). However, according to Gadow, in the green woodpecker (*Picus viridis*), this muscle originates on the shoulder girdle, passes the entire length of the trachea, and inserts on the thyroid and the median "Zungengerüst." I find nothing comparable to this in my dissections of the pileated woodpecker.

MUSCLES OF THE HEAD AND TRUNK

M. temporalis—

Origin.—Fleshy, from the temporal fossa and a small area inside of the orbit (fig. 27, a).

Insertion.—The fibers fuse, in part, with those of the *M. masseter*, others converge into a strong tendon which inserts along the top of the coronoid process of the lower jaw (fig. 27, a).

Remarks.—From its point of origin it passes downward, inside the lateral ligament, to the lower jaw.

M. masseter—

Origin.—Tendinous, from the bony ridge above the ear opening (fig. 27, *a*).

Insertion.—Fleshy, in the masseteric fossa on the outer side of the mandible (fig. 27, *a*).

Remarks.—From its point of origin it passes downward and forward, beneath the zygoma, to spread out fan-shaped over the side of the mandible.

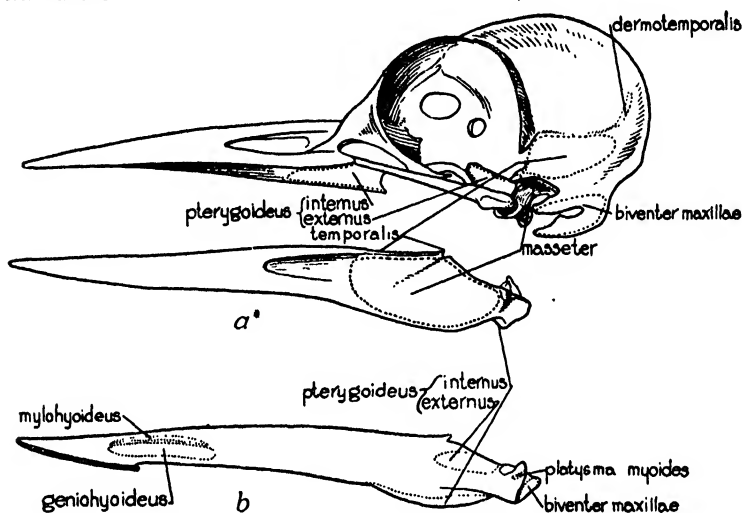


Fig. 27. *Ceophloeus pileatus picinus*; *a*, lateral view of skull, $\times 1$, showing muscle attachments; *b*, inner view of mandible, $\times 1$, showing, among other things, the area of attachment for the *M. mylohyoideus* above that for the *M. geniohyoideus*. Mus. Vert. Zool. no. 31301.

M. biventer maxillae—

Origin.—Fleshy, from most of the cowry-shaped tympanic apparatus (fig. 27, *a*).

Insertion.—Fleshy, from the proximal end of the mandible, on the articulare (fig. 27, *b*).

Remarks.—This short thick muscle covers the posterior portion of the mandibular articulation.

M. entotympanicus—

Origin.—Fleshy, along the lateral border of the sphenoidal rostrum.

Insertion.—On the pterygoid, near its articulation with the quadrate, and on the inner surface of the quadrate bone.

Remarks.—This is a slender muscle that, in the woodpecker, has very little function. It would serve to pull the quadrate forward and elevate the upper mandible, but as there is very little, if any, movement between the premaxillae and the skull, in the woodpecker, this muscle is of very little concern.

M. pterygoideus internus—

Origin.—Fleshy, from the dorsal and ventral surfaces of the posterior part of the palatine bone, and tendinous, along the outer border of the same bone, also from the sphenoidal rostrum and the lower border of the pterygoid (fig. 27, *a*).

Insertion.—Along the inside of the ventral border of the lower mandible, extending anteriorly from the articular surface (fig. 27, *b*).

Remarks.—This large muscle covers most of the palatal region. It arises in two main parts from this region, one dorsal to and one ventral to the palatine bone.

M. pterygoideus externus—

Origin.—On the outer surface of the orbital process of the quadrate bone (fig. 27, *a*).

Insertion.—On the inner surface of the mandible near its dorsal border, and extending anteriorly from the articular surface (fig. 27, *b*).

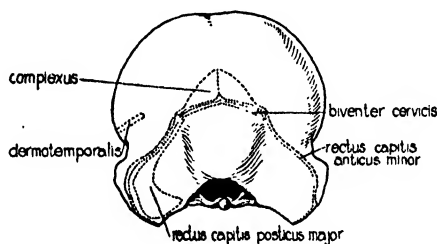


Fig. 28. *Ceophloeus pileatus pioinus*; posterior view of skull, $\times 1$, showing areas for muscle attachments. Mus. Vert. Zool. no. 31301.

M. digastricus—

Origin.—Tendinous, from the basicranium, on the externo-lateral angle of the basitemporal plate.

Insertion.—In a tendinous raphe in the mid-ventral line, between the two mandibles.

Remarks.—From its point of origin this muscle passes ventrally along the outer border of the *M. geniohyoideus* for a short distance, then spreads out into a thin sheet that meets its mate, from the other side, in the center. It passes nearly to the *M. mylohyoideus*. This muscle underlies the *M. platysma myoides*.

M. complexus—

Origin.—Tendinous, by two digitations, from the transverse processes of the third and fourth cervical vertebrae, respectively.

Insertion.—By a thin tendinous sheet high on the occiput of the skull, and fleshy, near the median portion of the occiput (fig. 28).

Remarks.—This is the most superficial of the muscles on the back of the skull; it spreads out as a flat sheet over most of the occiput and joins its mate, in the median line, in a strong raphe.

M. rectus capitis anticus minor—

Origin.—By a thin tendinous sheet from the ventral processes of the second, third, and fourth cervical vertebrae.

Insertion.—Fleshy, on an area at the back of the auditory apparatus, and by thin tendinous fascia, on the superior aspect of the occiput (fig. 28).

Remarks.—This muscle runs nearly parallel to, and in close contact with, the *M. complexus*, but is lateral and ventral to that muscle. Its line of insertion on the back of the skull is continuous with that of the *M. complexus*.

M. flexor capitis inferior—

Origin.—Tendinous, from the ventral surface of the atlas and, in common with the *M. rectus capitis anticus minor*, from the second, third, and fourth cervicals.

Insertion.—Fleshy, on nearly the entire basitemporal plate at the base of the skull.

Remarks.—This is a paired muscle, but the two halves are so closely connected in the mid-ventral line as to appear, superficially, as one muscle. This is a strong flexor of the head and is well developed in the woodpecker.

M. rectus capitis posticus major—

Origin.—Tendinous, from the neural spine of the second cervical vertebra; it covers the area from the tip to the base of the spine.

Insertion.—Fleshy, on a crescentic area at the back of the skull, beneath the insertion of the *M. rectus capitis anticus minor* (fig. 28).

Remarks.—This is a short fan-shaped muscle which spreads out on the back of the skull. It is a powerful extensor of the skull and is completely covered by the *M. rectus capitis anticus minor*.

M. biventer cervicis—

Origin.—Tendinous, in common with the tendon of the *M. longus colli posticus*, from the neural spine of the second thoracic vertebra.

Insertion.—Fleshy, on the occiput near the median line, just above the *M. rectus capitis posticus major*; it lies beneath the *M. complexus* (fig. 28).

Remarks.—From its small tendinous origin this muscle soon expands into a flat spindle-shaped muscle, about 3.5 cm. long in the pileated woodpecker, which again tapers into a small tendon. The tendon passes on up the dorsal region of the neck and when within 2 cm. of the point of insertion it expands again into a small flat muscle which is 5 mm. wide at its point of insertion on the back of the skull.

M. longus colli posticus—

Origin.—By a thin sheet of tendon from the neural spines of the first four thoracic vertebrae.

Insertion.—By a strong tendon on the transverse process of the axis vertebra.

Remarks.—This muscle is quite complicated in its structure. At the posterior end a series of six fleshy fasciculi is given off. Each of these is directed anteriorly and they are inserted on the postzygapophyses of the last six cervical vertebrae respectively. The anterior-most of these fasciculi is the longest; they decrease in length successively as one passes posteriorly. Where the series of posterior fasciculi terminates an anterior series begins, but members of this anterior series are directed posteriorly instead of anteriorly as was the case in the other series. The posterior fasciculus is attached to the neural spine of the seventh cervical vertebra, the anterior fasciculus of the posterior series is attached to the postzygapophysis of the same vertebra. Anterior to this there are three more fasciculi attached to the neural spines of the sixth, fifth, and fourth cervicals, respectively.

M. sacrolumbalis—

Origin.—Tendinous, from the anterior dorsal margin of the ilium and from the transverse processes of the last three thoracic vertebrae.

Insertion.—By a strong tendon to the postzygapophysis of the first thoracic vertebra and by fleshy digitations to the transverse processes of the second and third thoracic vertebrae.

Remarks.—This is a rather small muscle, lying along the dorsum just lateral to the *M. longissimus dorsi*.

M. longissimus dorsi—

Origin.—Fleshy, from the inner half of the anterior margin of the ilium and from the dorsal surface of the transverse processes of the last five thoracic vertebrae, also by tendons from the anterior tips of the neural spines of the synsacrum and the three vertebrae anterior to it.

Insertion.—By short tendons to the posterior ends of the neural spines and to the postzygapophyses of the first six thoracic vertebrae.

Remarks.—At its anterior end this muscle fuses, in part, with the tendon of the *M. longus colli posticus*. It lies within the angle made by the neural spines and the transverse processes of the thoracic vertebrae. The tendons of origin cross with those of insertion so that when the muscle is pulled away from the neural spines the tendons form a series of X's.

M. obliquus colli—

Origin.—Tendinous, by a series of seven fasciculi, from the diapophyses of the sixth to the twelfth cervical vertebrae inclusive.

Insertion.—Tendinous, on the postzygapophyses of the third to the ninth cervical vertebrae inclusive.

Remarks.—The fibers of each fasciculus are continuous, in part, with those of the fasciculus just anterior so that the whole mass is rather intimately connected.

M. longus colli anterior—

Origin.—Fleshy, from the lateral surfaces of the hypapophyses of the tenth to the fifteenth vertebrae inclusive.

Insertion.—By a strong tendon on the hypapophysis of the atlas.

M. rectus capitis lateralis—

Origin.—Tendinous, from the diapophyses of the second, third, and fourth cervical vertebrae.

Insertion.—By a tendon to the posterior border of the basitemporal, slightly anterior and lateral to the occipital condyle.

M. trachelomastoideus—

Origin.—Semitendinous, from the postzygapophyses of the second and third cervicals.

Insertion.—Tendinous, on the basitemporal near its posterior border, just external to the insertion of the *M. rectus capitis lateralis*.

Mm. interspinales—

These small muscles lie between the neural spines of the most anterior cervical vertebrae from the second to the sixth inclusive. They are absent in the dorsal and lumbar regions, but again appear in the caudal region where they are to be found between the neural spines of the free caudal vertebrae, including the last caudal and the pygostyle.

Mm. interarticulares—

A series of deep-seated intervertebral muscles found in the cervical region connecting the postzygapophysis of each vertebra with the same process on the vertebra just anterior; each postzygapophysis has attached to it the anterior end of one of the muscles and the posterior end of another.

M. triangularis sterni—

Origin.—By three tendons, from the inner surfaces of the first three sternal ribs respectively.

Insertion.—Fleshy, on the inner surfaces of the second, third, and fourth sternal ribs and on the membrane connecting these ribs.

Remarks.—Gadow (1891, p. 125) gives five points of origin for this muscle in *Picus*. I find only three points of origin in my dissections. Contraction of these muscles draws the sternal ribs forward and upward at the posterior end, thus increasing the cubic content of the thoracic cavity and aiding in inspiration. This is opposite to what Shufeldt (1890, p. 295) gives for the raven. He says that they become a powerful auxiliary to the act of expiration.

Mm. intercostales externi—

Origin.—From the posterior border of each of the dorsal ribs, except the last, on that part of the rib extending from the uncinate process to the articulation with the sternal rib.

Insertion.—On the anterior surface of the distal half of each dorsal rib next posterior to the rib on which the muscle originates.

Remarks.—The fibers of these muscles run obliquely in a postero-ventral direction. Contraction brings the ribs forward and aids in inspiration. As one passes posteriorly in the series the muscles become successively smaller until the last one is of practically no consequence.

Mm. intercostales interni—

Origin.—From the anterior border of the distal half of each of the dorsal ribs except the most anterior one.

Insertion.—On the posterior border of each rib next anterior to the one on which the muscle originates.

Remarks.—Contraction pulls the ribs backward, opposite to the action of the *Mm. intercostales externi*, and aids in expiration. The fibers of these two sets of muscles cross one another in the form of an X. The fasciculi of the *Mm. intercostales interni* become smaller as one passes anteriorly in the series. The most anterior muscle is very small and insignificant.

Mm. appendicocostales—

Origin.—Each muscle of this series has a tendinous origin from the posterior edge of an uncinate process.

Insertion.—Each muscle inserts, fleshy, on the outer surface of the rib just posterior to the one carrying the uncinate process from which the muscle originates.

Remarks.—The fibers of each of these small flat muscles pass downward and backward to the mid-portion of the rib next posterior to the one on which the muscle originates. Contraction pulls the sternal ends of the ribs forward thus increasing the extent of the thoracic cavity.

M. obliquus externus abdominis—

Origin.—By a thin tendinous fascia, from the lateral surfaces of the dorsal ribs, along a line drawn at the bases of the uncinate processes, from the inferior margin of the post pubis (fig. 24), and from the posterior border of the sternum (fig. 8).

Insertion.—By a thin tendinous fascia along the *linea alba*, in the mid-ventral line, for the anterior two-thirds of the abdominal region.

Remarks.—The fibers of this thin sheet of muscle pass ventrally from their line of origin. This is the most superficial of the abdominal muscles and, with its mate from the other side, almost entirely encases the abdomen.

M. obliquus internus abdominis—

Origin.—Semitendinous, from the inferior border of the pubis, extending from the pectineal process in front to the posterior margin of the ischium behind (fig. 24).

Insertion.—Fleshy, from the posterior surface of the last dorsal rib, except for the extreme promixal end, and from the head of the last sternal rib where the latter articulates with the dorsal rib.

Remarks.—The fibers of this thin sheet of muscle run anteriorly and ventrally. Contraction decreases the size of the body cavity by drawing the ribs back closer to the pelvis.

M. rectus abdominis—

Origin.—Semitendinous, from the entire posterior border of the sternum (fig. 8).

Insertion.—As an aponeurosis along the *linea alba*, from the membrane which spreads between the distal ends of the postpubis, and on the posterior portion of the postpubis itself (fig. 24).

Remarks.—This muscle lies just beneath the *M. obliquus externus abdominis*. The fibers run backward and toward the mid-ventral line.

M. transversus abdominis—

Origin.—By an aponeurosis, from the inner half of the posterior border of the sternum (fig. 8).

Insertion.—By an aponeurosis, into the *linea alba*, the membrane between the postpubic processes, and on the free portion of the postpubis (fig. 24).

Remarks.—This is a very thin muscle in the woodpecker and is mostly aponeurotic in character. It makes no connection with the ribs as it does in the raven (Shufeldt, 1890, p. 305).

M. transversus perinei—

Origin.—Tendinous, from the posterior border of the ischium and the posterior margin of that part of the postpubis that extends behind it (figs. 18 and 24).

Insertion.—Certain of the fibers are inserted into the tendinous fascia that surrounds the anus, but most of them pass ventrally to the mid-line where they meet the fibers from the other side in dense fascia anterior to the anus.

Remarks.—This thin sheet of muscle passes around the ventral surface just anterior to the anus. It helps to support the viscera of this region.

MUSCLES OF THE TAIL

M. levator coccygis—

Origin.—Fleshy, from the superior surfaces of the transverse processes of the free caudal vertebrae, except the pygostyle, and from the ilium on either side of the mid-dorsal line, extending anteriorly to a point just beyond the acetabular region (figs. 18, 19, and 24).

Insertion.—By tendons, to each of the neural spines of the free caudal vertebrae and to each side of the anterior edge of the large neural spine of the pygostyle.

Remarks.—This is the largest of the dorsal muscles of the tail. It dwindles out to a thin point in front, expands posteriorly until the posterior border of the ilium is reached, then the fibers converge into the large tendon that inserts into the pygostyle. This is the principal levator of the tail.

M. levator caudae—

Origin.—From the upper surfaces, near the ends, of the transverse processes of the last four caudal vertebrae.

Insertion.—Onto the upper surfaces of the bases of the four central rectrices on each side (figs. 18 and 19).

Remarks.—This is a much less extensive muscle than the *M. levator coccygis*. It serves to elevate the tail.

M. depressor caudae—

Origin.—By a tendinous sheet, from the posterior rim of the lower part of the ischium and from most of the posterior border of the free part of the postpubis (fig. 24).

Insertion.—Tendinous, onto the base of the fifth tail feather (fig. 19).

Remarks.—The fibers gradually converge as they pass upward and backward to the point of insertion. Contraction spreads the tail feathers and pulls them downward when aided by the mate from the other side. This thin muscle lies beneath the *M. transversus perinei* and above the *M. depressor coccygis*.

M. depressor coccygis—

Origin.—Fleshy, from a small area on the inner surface of the posterior portion of the ischium and the proximal one-fourth of the free postpubic process (fig. 19).

Insertion.—Semitendinous, to the upper half of the lateral border of the disc of the pygostyle (fig. 29).

Remarks.—This is one of the larger depressors of the tail. Contraction pulls the pygostyle, and with it the tail feathers, downward when aided by the mate from the other side, downward and to the side when acting alone.

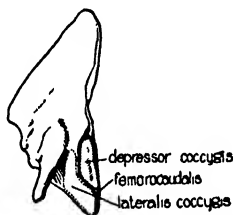


Fig. 29. *Ceophloeus pileatus picinus*; lateral view of pygostyle, $\times 1$, showing areas for attachment of the tail muscles. Mus. Vert. Zool. no. 31301.

M. lateralis caudae—

Origin.—By fasciculi, from the ends of the transverse processes of the last four free caudal vertebrae.

Insertion.—Tendinous, to the bases of the third, fourth, fifth, and sixth tail feathers.

Remarks.—Contraction pulls the outer tail feathers laterally.

M. lateralis coccygis—

Origin.—Fleshy, from quite an extensive area on the inner surface of the posterior portion of the ilium, extending anteriorly to the first free caudal vertebra, and by tendinous fasciculi from the under surfaces of the transverse processes of the free caudal vertebrae (fig. 19).

Insertion.—Partly fleshy and partly tendinous, on the anterior surface of the lower half of the disc of the pygostyle (fig. 29).

M. infracoccygis—

Origin.—From the under surfaces of the transverse processes of the free caudal vertebrae, near the mid-line, and from the posterior surfaces of the chevron bones.

Insertion.—To the anterior surfaces of the chevron bones and to the anterior portion of the disc of the pygostyle near its lower median surface.

SUMMARY

The skeleton of the woodpecker shows a number of adaptive modifications, the more obvious of which are in the skull and pygostyle. The skull is modified most, from an assumed ancestral type, in those forms that are most arboreal in their habits, forms that drill into bark and wood for food, and least in those forms that are least arboreal in their habits, forms that obtain their food from the ground or small branches. There is a positive correlation between the structure of the skull and the habits of the birds. There is also a positive correlation between the relative size of the pygostyle and the habits of the birds. In the skull the arboreal habits of the birds are correlated with a wider cranium, wider, straighter bill, lateral shifting of the narial openings, with these openings better protected, relatively larger brain case, with a folding under of the frontals along their line of contact with the premaxillae, and, in general, a more strongly built skull than is found in the less arboreal types.

The wing varies somewhat in length in the different forms. The leg bones are only slightly variable.

The musculature of the woodpeckers studied differs in small details in the different genera. The woodpeckers may be divided into two groups with regard to the presence or absence of the accessory semitendinosus muscle. It is present in *Colaptes*, *Asyndesmus*, *Melanerpes*, *Balanosphyra*, *Centurus*, and *Ceophloeus*; it is absent in *Xenopicus*, *Sphyrapicus*, *Dryobates*, and *Picoides*. In all but the three-toed woodpecker the tendon of the *M. flexor hallucis longus* divides, near the distal end of the *tarsometatarsus*, into three parts and a branch passes to each of the first, second, and fourth digits, respectively, whereas the third digit is supplied by the tendon of the *M. flexor perforans digitorum profundus*. In the three-toed woodpecker the same arrangement holds except for the absence of the branch to the first digit, which is lost in this form. The point of origin of the *M. dermatotemporalis* varies considerably in the different forms studied. It may be near the back of the skull as in *Ceophloeus* or it may be situated anteriorly just back of the orbit as in *Sphyrapicus*. The method of attachment of the *M. ceratotrachealis* to the trachea is slightly different in different genera. In *Ceophloeus* it does not wind around the trachea, while in *Picoides* each of the pair of muscles passes about two-thirds the distance around the trachea at

its point of origin. The *M. pectoralis tertius* does not have an attachment to the sternum, but arises wholly from the underlying *M. subclavius* and the coracoid bone.

CONCLUSIONS

We can divide the woodpeckers into two groups according to whether or not the accessory semitendinosus muscle is present (Garrod, 1873). They can be divided into the same two groups by the type of skull, that is, whether the frontals are folded under or not. These are rather deep-seated characters, and in the minds of some taxonomists would probably be considered as having subfamily value. It appears, accordingly, as though there have been two main lines of descent in the family Picidae. The one line has culminated in *Picoides*, *Dryobates*, *Xenopicus*, and *Sphyrapicus*. The other, a group less specialized for arboreal life, is now represented, in North America, by *Ceophloeus*, *Centurus*, *Balanosphyra*, *Melanerpes*, *Asyndesmus*, and *Colaptes*.

We know very little about the ancestral types of woodpeckers because of the total absence of fossil forms older than the Pleistocene. We must therefore base our conclusions as to phylogenetic relationships on study of recent material. If we consider that the ancestral birds were terrestrial and that the arboreal habit was a later specialization, then we can well consider the flicker as the most generalized and the three-toed woodpecker as the most specialized of the North American types. There is a possibility that the flicker was once more arboreal than it is today and that now it is going back to the terrestrial mode of life as a secondary trend; but judging from the structure of the bird it never did reach the stage of arboreal specialization that we now find in the three-toed woodpecker. It seems reasonable, as far as the present study shows, to think of the flicker of today as being the type that most nearly represents the ancestral form of the true woodpeckers, and to place the three-toed woodpecker farthest from the primitive ancestral type.

The adaptive modifications in the various structures such as the tail feathers, pygostyle, or skull show a positive correlation with the habits of the birds. This correlation is repeated many times in the group, and because of its recurrence the evidence is strengthened for considering that the environment, likely, at least in part, through natural selection, has been an important factor in modeling the group as we see it today.

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